PLANT BREEDING ABSTRACTS

Vol. XXVIII, No. 4
(Abstracts Nos 3606—4947)

Compiled from World Literature
by the

COMMONWEALTH BUREAU OF PLANT BREEDING AND GENETICS

1 October, 1958

Commonwealth Agricultural Bureaux,
Farnham Royal, England

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C. A. B.
20 OCT 1958
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Plant Breeding Abstracts

Vol. XXVIII, No. 4

STATISTICS

3606 Oktaba, W.
Metoda kompletnego uwikłania interakcyj z podblokami w doświadczeniach czynnikowych o dwu, trzech, czterech i pięciu poziomach każdego z czynników. **(Method of complete confounding of interactions with subblocks in factorial experiments with two, three, four and five levels of each factor).**
Ann. Univ. M. Curie-skłodowska : Sect. E. : 1956 : **11** : 123–86.

The use of the method of complete confounding in the design and analysis of factorial experiments with two, three, four and five levels for each factor is described with numerous examples. Tables showing the types of confounding and suitable combinations of incomplete blocks for use in various types of factorial experiments are included.

3607 Horváth, A. & Sváb, J.
Válasz Schnell Lászlóné "Hozzászólás"-ára. **(Reply to Mrs. László Schnell's remarks).**
Növénytermelés 1957 : **6** : 181–82.

In this further reply to criticisms made earlier [XXVIII, 1114*], the practical value of the method developed by the authors is reaffirmed.

3608 Wang, H.-L.
(Studies on the analysis of pairing experiments).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1958 : **9** : 88–97. [Chinese].

Improvements in the Chinese pairing method for field trials are suggested. In particular, it is suggested that the varieties should be arranged at random so that the usual method of analysis of randomized blocks can be applied if necessary. [Cf. 1115].

3609 Kapur, M. N.
Some investigations on the problem of ranking of varieties.
Statist. News Lett. 1957 : **7** : p. 16. (Abst.)

Decision procedures, in particular Paulson's procedure, for choosing a superior variety on the basis of experimental evidence are compared with the *F* test. A possible generalization of Bahadur's 3-decision procedure is also considered.

3610 Goch, D. G.
Examination of residuals in the analysis of variants.
S. Afr. J. Sci. 1958 : **54** : 67–69.

In the standard method of analysis of randomized-block experiments, the expression for yield contains a residual term expressing unknowns associated with plot position and time of preparation. The author considers what further information, for instance on soil heterogeneity, can be obtained when the residuals are estimated and ordered by plot position.

3611 Wright, G. M.
The estimation of missing values in factorial experiments.
NZ J. Sci., 1958 : **1** : 1–8.

The preliminary paper describing this work has been summarized already [XXVII, 993]. The present paper gives the detailed derivation of the general formula and also gives simpler formulae for cases involving more than four factors.

3612 Baker, G. A. & Roessler, E. B.
Implications of a uniformity trial with small plots of wheat.
Hilgardia 1957 : **27** : 183–88.

A trial designed to test the effect of direction of ploughing gave no evidence of any effect and is therefore treated as a uniformity trial. In contrast to some recent experiments, the present trial corresponded closely to the theoretical model and conformed to the tests applied. Errors of the first and second kinds were controlled according to expectation.

GENETICS

3613 Haspelová, A. & Rabanová, L.
Diskusia o stave genetiky v ČSR. **(A discussion on the state of genetics in the Czechoslovakian Republic.)**
Biológia, Bratislava 1957 : **12** : 310–13.

A report on a conference at Prague University in 1956 is presented. The principal address, delivered by K. Hrubý, reaffirmed the faith of

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* References in square brackets are to volume and number of entry in *Plant Breeding Abstracts.*

Czechoslovakian geneticists in classical genetics and the chromosome theory. Lysenkoist genetics was criticized mainly on the grounds of inaccurate experimental technique. Its harmful influence upon Soviet genetics is said to have been repaired and it is stated to have also brought some benefits, such as the stimulation of research in physiological genetics and the establishment of close links between theoretical and practical research.

3614 **[Forty years of Soviet biology (1917–1957)].**
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1957 : No. 6 : 649–73. [Russian].

A review of achievements in biology, including genetics and evolutionary studies, during the above period is presented.

Proceedings of the Genetics Society of Canada 1956 : **1** : Pp. 32.

3615 *Arnason, J. T. Maternal inheritance of leaf variegation in a hexaploid wheat. (p. 24) (Abst.).*

[Cf. XXVII, 1555].

3616 *Bowden, W. M. Cytotaxonomic studies on northern grasses. (p. 25). (Abst.).*

Over 1,100 accessions of species and natural hybrids of *Agropyron*, mostly collected in Canada, have been studied cytotaxonomically at the Department of Agriculture, Ottawa. Some of the artificial hybrids obtained, such as *A. spicatum* ($2n$) x *A. dasystachyum* ($4n$), resembled natural hybrids.

About 630 accessions representing many other genera, collected in Canada, have also been investigated. The chromosome numbers reported include: *Elymus mollis*, invariably with $2n = 28$; *Festuca baffinensis*, $2n = 28$; and $2n = 42$ in *F. saximontana* and *F. brachyphylla*.

The single F_1 hybrid seedling raised from *E. virginicus* x *Hordeum jubatum* was highly vigorous, meiotically irregular and completely sterile.

3617 *Boyes, J. W. & Povilaitis, B. Fertility problems in red clover. (p. 25) (Abst.).*

Factors affecting seed production in Dollard have been studied at the Department of Genetics, McGill University. Meiotic irregularities failed to account for the high degree of pollen abortion and low seed yield in some plants. Among ten progenies, only one highly significant correlation was obtained between seed number per head and percentage of aborted pollen; for the pooled population of all the progenies a correlation coefficient of – 0·466, significant at the 1% level, was however obtained. Correlations between percentage of normal mature embryo sacs and seed number per head were significant in only two of ten lines grown in a polycross test, but for all the lines r was 0·393, significant at the 1% level. The mean seed number per head in progenies from outcrosses was significantly higher than the mean for progenies from sib crosses, plants giving the highest seed yield frequently being derived from outcrosses involving parents high in seed-yielding capacity.

3618 *Goplen, B. E., Greenshields, J. E. R. & White, W. J. The inheritance of coumarin content in sweet clover. (pp. 26–27). (Abst.).*

The following mode of inheritance of coumarin content is postulated from F_2 data on appropriate crosses. Cu_2 controls the production of coumarin. Cu_1, in association with Cu_2, results in free coumarin. Coumarin is in the bound form when the plant contains Cu_2 and cu_1 cu_1. Plants with Cu_1 and cu_2 cu_2 are coumarin deficient. Most of the data could be interpreted on the basis of the above assumptions. In the case of crosses of two coumarin-deficient plants with four plants with free coumarin, two additional genes, Cu_3 and Cu_4, appeared to be operating in a complementary manner to produce coumarin. [Cf. 615].

3619 *Kerber, E. R. Chromosome behaviour in autotriploids of barley. (p. 27) (Abst.).*

Autotriploids occurred spontaneously in the barley Gateway with a frequency of 1 in 6,000 plants. At metaphase I various combinations of trivalents, bivalents and univalents were noted. From 0 to 6_I lay on each plate, oriented and unoriented, or in a position ranging from near the plate to the poles. At anaphase I, 0–5 lagging univalents were observed. At this stage the chromosomes were distributed at random to the poles. It was calculated that only those chromosomes at or near the metaphase plate lagged and divided at anaphase; the lower frequencies of laggard classes at anaphase when compared with the corresponding classes of univalents at metaphase were thus explained. Univalents outside the spindle at anaphase did not divide but formed microcytes at telophase. Misdivision of lagging univalents occurred with a low frequency at anaphase-telophase. Daughter univalents usually lagged at anaphase-telophase II and frequently misdivided, giving rise to micronuclei in about 65% of the tetrads. The percentage of good pollen ranged from 0 to 27% from anther to anther. The average fertility of the selfed triploids was 4·16%. The progeny included disomics, trisomics, plants with $2n = 16$ and one triploid.

3620 *Knott, D. R. The inheritance of resistance to stem rust races 15B and 56 in nine Kenya varieties of wheat. (pp. 27–28). (Abst.).*

[Cf. 1567].

3621 *McGinnis, R. C., & Melnyk, J. H. Genome analysis in Aegilops. (p. 28). (Abst.).*

The above analysis at the Cereal Breeding Laboratory, Winnipeg, has been carried out mainly on *Ae. juvenalis* and *Ae. crassa*, observations being made on pairing at metaphase I in F_1 hybrids from interspecific and intergeneric combinations. The genome formula C^UDS is assigned to *Ae. juvenalis*, the original contributing species being postulated as *Ae. umbellulata* (C^U), *Ae. squarrosa* (D) and *Ae. speltoides* (S). Evidence has been obtained of the presence of C^U and D in *Ae. crassa.* [XXVII, 446 and 2843].

3622 *Naylor, J. M. Chromosome substitution in durum wheat. (p. 29). (Abst.).*

Little progress has been made in developing a monosomic series in durum wheat at the University of Saskatchewan. Except rarely in the case of chromosome V, monosomics have not been recovered from crosses of the durum variety Golden Ball with monosomic lines (I–XIV) of Chinese Spring. Probably 13-chromosome gametes do not ordinarily function or, if they do, embryo failure is of regular occurrence. Vigorous, self-fertile plants with $13_{II} + 2_I$ have however been readily obtained from crosses with 8 of the 14. Gametes with the constitution $13^{AB} + 1^D$ are therefore functional. The disomic substitution $13^{AB}{}_{II} + 1^D{}_{II}$ requires functional ♂ and ♀ gametes with $13^{AB} + 1^D$ chromosomes. Plants with disomic substitution of chromosome II, V, and VI and probably XII have been identified. The possible use of disomic substitution lines in the analysis of homeology among chromosomes of genomes A, B and D and in breeding durum wheat is briefly indicated.

3623 *Sarkar, P. Studies on the B genome of wheat. (p. 30). (Abst.).*

[Cf. XXVII, 370].

3624 *Walker, G. W. R. Cytology of caryopsis development in Triticum-Agropyron amphiploids. (pp. 31–32). (Abst.).*

The results of an analysis of postfertilization development in 560 ovaries after selfings and reciprocal crosses of four F_1 amphidiploids of *T. turgidum* x *A. intermedium*, with $2n = 66$, 66–7, 66 and 70 respectively, are summarized. Support was gained for the previous conclusion that fertilization stasis (complete arrest of development) at any stage from micropylar entry to initiation of division in the primary endosperm and zygote nucleus is a major cause of sterility [XXVII, 1416]. Estimates are given for (1) frequencies of fertilization stasis in the selfings and crosses, (2) gametic components of fertilization stasis (frequency in selfs) and (3) products of gametic components for the three sets of reciprocal crosses. The estimates suggested that (*a*) the $2n = 70$ plants had a relatively high degree of chromosomal imbalance which was transmitted by the gametes and expressed in fertilization stasis or severe retardation of early endosperm development, and (*b*) fertilization stasis was the outcome of the combined effects of chromosome imbalance in the ♀ and ♂ gametes. Multiple embryo sacs occurred with an average frequency of 3·2%.

Proceedings of the Genetics Society of Canada 1957 : 2 : Pp. 50.

3625 *Stern, H. Perspectives in chromosome physiology. (pp. 3–8).*

Recent views on the relationship between gene replication and the metabolic activity of the gene are discussed. It is pointed out that gene action and gene replication are separated in time and may even be functions of different parts of the chromosome.

3626 *Arnason, T. J., Forgay, M. & Cormack, D. V. The effects of pulsing a γ-radiation dose on the frequency of chromosome breakage. (pp. 9–13).*

When a dose of 350–360 r., given at the rate of 12–40 r. per minute, was pulsed with dark intervals of 0·07–1·9 sec. between successive pulses, the frequency of chromosome breakage in microspores of *Tradescantia*, irradiated during the resting stage, was 5·5–27·8% lower than in microspores which received a similar dose of uninterrupted radiation at the same rate. Very short pulses (dark intervals 0·016 sec.) did not reduce the frequency of breaks or reunions (2-hit aberrations) below the values obtained with low-intensity uninterrupted radiation. Frequencies of reunion were 4·5–32·8% lower when the dose was pulsed with dark intervals of 0·048–1·9 sec. than with low-intensity uninterrupted treatment. The highest numbers of breaks and reunions were obtained with high-intensity continuous treatment.

An uninterrupted dose of 393 r. administered to *Narcissus* roots in 2·62 min. yielded 13% more aberrations in anaphase cells than a similar continuous dose applied in 8·21 min., and 30% more than pulsed doses (dark periods 1·32 and 0·10 sec.).

It is suggested that restitution may begin immediately after breakage and that dark periods in pulsed doses provide conditions generally more favourable to the initiation of restitution than are provided during irradiation.

3627 *Löve, Á. & Löve, D. Drug content and polyploidy in Acorus. (pp. 14–17).*

A taxonomical survey by the authors has indicated that the genus contains $2x$, $3x$ and $4x$ species. Reports in the literature have indicated that drug content increases with degree of polyploidy in *Acorus* and other genera. It is suggested that selection, combined with artificial polyploidization, offers a means of securing improvements in the production of medicinal drugs.

3628 *Walker, G. W. R. Observations of divisions in living pollen mother-cells and pollen grains of* Tradescantia. *(pp. 18–22).*

A slide-culture technique for PMCs and pollen grains is described. Taylor's medium was used, with the exception of substitution of isotonic sucrose for 4% sucrose. About 9% sucrose is isotonic for pachytene, 6% for the kinetic stages of meiosis, 8% for tetrads and 10% for first pollen mitosis. Effectiveness of the medium is not influenced by pH within the range 4·4 to 6·4. Using this technique, PMCs have been cultured from late diakinesis to the tetrad stage, and pollen grains from late prophase of the first mitosis to the subsequent resting stage. Cultures have been obtained of normal undamaged cells at pachytene which in some cases underwent an abnormal meiosis.

3629 *Löve, Á. & Löve, D. Arctic polyploidy. (pp. 23–27).*

The authors review evidence obtained by themselves and other investigators showing that the frequency of polyploids increases with an increase in latitude. The high frequency of polyploids in the Arctic is ascribed to a greater ability than is possessed by diploids to survive under adverse conditions, such as those prevailing in this region during the pleistocene glaciations. It is emphasized that the Hagerup hypothesis considers only the frequencies of polyploids and not the degree of polyploidy; the latter problem requires attention in distributional studies.

3630 *Rajhathy, T. Monogenic heterosis and rust resistance in* Antirrhinum majus *L. (pp. 28–30).*

In investigations at the Agricultural Research Institute of the Hungarian Academy of Sciences, Martonvásár, a dominant single-gene mutation was found to have a heterotic effect.

3631 *Löve, Á. Sex determination in* Rumex. *(pp. 31–36).*

Literature on the chromosomal basis of sex determination in *Rumex* is surveyed and discussed.

3632 *Morrison, J. W. & Rajhathy, T. Cytogenetic studies in Blue A wheat. (p. 43). (Abst.).*

Blue A, a strain with blue aleurone, was obtained from repeated back crosses of *Agropyron elongatum* x *Triticum vulgare* to *T. vulgare*. By means of Blue A x Thatcher, an attempt was made to determine the mode of inheritance of blue aleurone and solid stem, both of which characters were derived from *A. elongatum*. All plants of Thatcher had 21_{II}, hollow stems and red seeds. One Blue A parent had 21_{II} and another $20_{II} + 1_{I}$, while others had $20_{II} + 1$ pair of short fragments. The hybrid plants were grouped into those with (1) solid stems and all seed blue, (2) solid stem and blue seeds in most ears but with one or two red or intermediate-coloured seeds in some ears, and (3) hollow stems and both red and blue seeds in most ears. Hybrids with $2n = 42$ usually had $19_{II} + 1_{IV}$. Some hybrids had $2n = 41$, while others contained isochromosomes or fragments. Pairing was restricted in a number of plants, nonhomology of some chromosomes thus being indicated. Red seeds in groups (2) and (3) gave rise to aneuploids and plants from most of the blue seeds carried fragments. Segregation for colour depended upon the segregation of a fragment or whole chromosome. Intermediate colours were however found in some seeds; genes in addition to the major one carried by this chromosome or its fragment must therefore have been responsible for colour. No evidence was obtained that genes for solid stem and blue aleurone were linked.

3633 *Cole, K. A genetical investigation of male sterility in green sprouting broccoli. (p. 44). (Abst.).*

Preliminary investigations have indicated that the ♂ sterility discovered in a single plant of Italian Green Sprouting is due to an independently-inherited single recessive gene, whose effect is expressed prior to or after elongation of the anther filaments and subsequent to tetrad formation.

3634 *Povilaitis, B. & Boyes, J. W. Possible segregation for sterility in red clover.* (*p. 44*). (*Abst.*)

Partially male-sterile plants studied at McGill University, Montreal, produce characteristic proportions of small empty pollen grains, while the partially female-sterile plants contain characteristic proportions of ovules which lack embryo sacs. Meiotic irregularities are too few to account for the two types of sterility, each of which appears to be at least partly under genetic control. Possibly both types are conditioned by some of the same group of genes or by genes overlapping in effect.

3635 *Bubar, J. S. An association between variability in ovule development within ovaries and self-incompatibility in* Lotus (*Leguminosae*). (*pp. 44–45*). (*Abst.*).

Cf. 3115.

3636 *Wakonig, R. Factors affecting radiosensitivity of chromosomes of related plant species.* (*p. 45*). (*Abst.*).

In an experiment in which the root tips were exposed to 180 r. of X rays, the chromosomes of *Allium cepa* were much more sensitive than those of *A. schoenoprasum.* The chromosomes of the former species are larger than those of the latter.

Abstracts of papers presented before the Radiation Research Society, Rochester, New York, May 13–15, 1957. Parts I and II.
Radiation Res. 1957 : 298–329; 436–64.

3637 *Bair, W. J., & Hungate, F. P. Effect of EDIA on the apparent radiosensitivity of yeast.* (*p. 302*).

The effects of ethylenediamino-tetraacetate (EDIA) on yeast cultured in the presence of plutonium were studied. The radiosensitivity of the yeast was enhanced; EDIA had similar effects with tritium. "Failure to observe enhanced sensitivity from EDIA with X-radiation delivered at relatively high dose rates indicates that the effect of EDIA may be on a specific cellular process such as chromosome breakage, rather than on reactive intermediates produced by radiation". On the other hand the differences may have been due to the relatively high linear energy transfer of α and weak β radiation as compared with X radiation.

3638 *Deering, R. A., & Setlow, R. B. Studies on the inhibition of cellular division of* E. coli *by low incident doses of ultraviolet light.* (*p. 312*).

It was found that doses of ultraviolet which did not effect the rate of total mass increase, or rate of DNA and RNA synthesis, inhibited cell division; visible light reversed the inhibition. The irradiated bacteria formed filaments across which cytoplasmic membranes appeared to exist at regular intervals. Ultraviolet sensitivity seemed to vary with the stage of the division cycle.

3639 *Guild, W. R. Evidence related to the effect of moderate doses on DNA in cells.* (*p. 320*).

From recent transformation studies it is concluded that "DNA in *vitro* is equally sensitive to direct and indirect actions of radiation, and that the probability is of the order of 1 for an ionization or a radical to cause a break in the molecule and/or to inactivate a genetic factor". Hence a dose of 100 r. can produce 1 to 5 damaged genes per bacterial cell from direct hits in the DNA alone; every radical which reaches the DNA can damage another gene. It is assumed that the cell has no mechanism for preventing immediate damage to the DNA. Many biological effects of doses of 100 to 1000 r. may therefore result from primary damage to genetic material but this is not proved.

3640 *Mortimer, R. K. X-ray-induced homozygosis in diploid yeast.* (*pp. 439–40*).

"Diploid yeast cells heterozygous at a number of different morphological loci concerned with adenine synthesis were exposed to X-rays, and the frequency of sectored and whole colony variants was observed. Doses producing relatively little inactivation resulted in a comparatively high frequency of homozygosis as evidenced by these variant colonies. The rate at which colonies were converted to these forms increased linearly with dose and also with the distance of the locus from its centromere. A study of half-sectored colonies produced by a cross containing a fermentation marker distal to one of the adenine loci indicated that mitotic crossing-over was responsible for the majority of these variant colonies. Other mechanisms of induced homozygosis also are indicated. At doses which produce only a small degree of inactivation it is estimated that a high percentage of the surviving cells experiences alteration of the genotype".

3641 *Tolmach, L. J. & Lerman, L. S. Selective effects of ultraviolet radiation and other agents on genetic transformation. (pp. 454–55).*

Previous work is said to have shown "that the frequency of genetic transformation among pneumococcus cells exposed to genetically active, undegraded DNA (labelled with tracer phosphorus) is directly proportional under a variety of conditions, to the amount of DNA incorporated". It was found that the capacity of the DNA to be incorporated into the recipient cells was much less sensitive to ultraviolet radiation than the capacity to transform susceptible cells to resistance to two different drugs, the genetic units of which did not appear to be linked. Ultraviolet-inactivated genes had therefore entered the cell. It was also found that the two genetic markers had different sensitivities and their inactivation curves were complex indicating that the process required one hit. Other DNA-inactivating agents did not have the same selectivity for genetic markers as ultraviolet light.

3642 LEWIS, D. & CROWE, K.
Unilateral interspecific incompatibility in flowering plants.
Heredity 1958 : **12** : 233–56.

Evidence is given in support of the view that unilateral incompatibility in interspecific matings of the type self incompatible (SI) ♀ x self compatible (SC) ♂ is of general occurrence. Observations on pollen-tube growth in intergeneric and interspecific crosses in the Solanaceae (*Lycium chinense* and *Solanum*, *Lycopersicon* and *Capsicum* spp.) and in crosses between members of the Solanaceae and of the Scrophulariaceae (*Antirrhinum* spp.) demonstrated that unilateral incompatibility is a feature of the gametophytic homomorphic system with one locus. Similar observations on pollinations among 12 species representing different genera of the Cruciferae, together with an examination of the literature, indicated that unilateral incompatibility may also be the rule in the sporophytic system. Self-compatible species not showing unilateral incompatibility are in general regarded as having only recently undergone mutation from the self-incompatible condition; the symbol Sc is used to denote such species. Species displaying unilateral incompatibility are also believed to have originated from self-incompatible ancestors but a long time ago. Data obtained by the authors and other investigators suggest that in the gametophytic system, at least in the Solanaceae and Scrophulariaceae, pollen inhibition in the mating SI ♀ x SC ♂ is stronger or earlier than inhibition upon selfing. In *Antirrhinum*, higher temperature had a similar effect in inhibiting pollen-tube growth in selfings and SI ♀ x SC ♂. A particularly interesting aspect of SI x SC inhibition is its general nature, in contrast to the high degree of specificity of self inhibitions of the type SI x SI. The former type may be explained in terms of the antigen-antibody hypothesis by assuming that (1) the S complex is necessary for the production of a pollen enzyme, (2) by a further activity of the S complex this enzyme is bound to a highly specific protein, and (3) the *S* gene produces two types of antibodies in the style, a "primitive" one able to combine with the unbound enzyme and a more recent one combining with the protein of the enzyme-protein complex. On this basis it is suggested that (*a*) SC species have only the enzyme, (*b*) SI species have the full array of antigens and enzymes, and (*c*) Sc species have two stylar antibodies and an altered protein antigen in the pollen.

With support provided by reported data on spontaneous and induced mutation in *Oenothera*, *Prunus* and *Trifolium*, it is postulated that the sequence of mutations leading to self compatibility in species belonging to families which are primarily and predominantly self incompatible is one bringing about the following sequence of reactions: SI → Sc → SC.

Interspecific and intergeneric pollinations in the Onagraceae led to the conclusion that the ring-forming, self-pollinating species of *Oenothera* behave as though they are recent Sc species, although it may be assumed that their autogamy has been established for a long period. Two possible modes of origin of a balanced lethal system by way of the self-incompatible condition are discussed: (1) mutation resulting in the change to Sc, followed by appropriate chromosomal structural changes, and (2) duplication (S_1 S_2) of the locus *S* in one chromosome and deficiency for this locus in the homologous chromosome. Evidence of both (1) and (2) has been obtained from *Oenothera*.

Finally, the evolution of outbreeding and inbreeding systems is discussed from the point of view of their adaptation to critical environmental conditions.

3643 PANDEY, K. K.
Time of the *S* allele action.
Nature, Lond. 1958 : **181** : 1220–21.

The author postulates that the time of expression of *S*-allele action in sporophytic systems of self incompatibility is subsequent to meiosis II but prior to the complete separation of the four microspores from the common cytoplasm, whereas in gametophytic systems the time of expression is after the separation of the microspores from the common cytoplasm. As reported by Rajan, irradiation of meiotic and tetrad stages of PMCs has not prevented seed set in *Brassica*, which has the sporophytic type of self incompatibility. This behaviour is explained on the basis of the above hypothesis as follows. "In the sporophytic systems [the suggested timing] would allow the specific substances (antigens?) produced by the *S* allele from one nucleus to diffuse into the cytoplasm of others. The four microspores of a pollen mother cell would thus have the same *S* reaction irrespective of the *S* allele contained in the individual microspores. With irradiation of nuclear tetrads, a mutation in the *S* allele of one nucleus would produce a decrease, in all the four microspores, of the amount of specific substances produced by that *S* allele. Normally, each of the four microspores of a pollen mother cell gets one-half of the amount of specific substances produced by one *S* allele. After mutation in one *S* allele, this amount will be reduced to one-half of the normal amount, namely, one-fourth of the amount produced by one *S* allele. This decrease of the specific substances may not be enough to prevent completely the incompatibility reaction, but may be low enough to allow a slow germination and growth of the pollen tube."

In gametophytic systems, incompatibility is expressed as pollen-tube inhibition and in sporophytic systems as inhibition of pollen germination. On the basis of the author's hypothesis these modes of expression are discussed in relation to the time of production of the specific substances.

Species with trinucleate pollen grains may be regarded as those in which nuclear activity is slightly precocious. This precocity leads from the gametophytic to sporophytic reaction. In members of the Gramineae which have been studied for self incompatibility, cytocinesis in the PMC is successive, as opposed to simultaneous. Self incompatibility in these species thus remains gametophytic in spite of precocity in nuclear division.

The author also briefly discusses the bearing of his hypothesis upon differences between the gametophytic and sporophytic systems with respect to (1) frequency of pseudofertility, (2) the possible effect of *S* mutation and (3) incompatibility reaction when autopolyploidization has been effected.

3644 HARM, W.

Multiplicity reactivation, marker rescue, and genetic recombination in phage T4 following X-ray inactivation.

Virology 1958 : **5** : 337–61.

"Multiplicity reactivation of T4 under conditions of intracellular X irradiation is about as extensive as for UV irradiated T4, the log of the multicomplex survival versus the doses, with a slope of about 0·25 that of the monocomplex survival function. Very little multiplicity reactivation occurs in extracellularly X-ray inactivated T4. Cross-reactivation of markers of intracellularly X-rayed T4 is as high as that of UV irradiated T4, whereas it is considerably lower with extra cellularly X rayed phage. The frequency of genetic recombination increases as a result of intracellular X irradiation, but decreases with extracellularly X rayed phages. All these differences observed with intracellular and extracellular phages can be explained by the hypothesis that the DNA of X ray inactivated phages has a decreased probability to complete an early step of infection. The dose function of this probability has been roughly estimated from the results of cross reactivation experiments. The similarity of the extent of multiplicity reactivation after UV and after intracellular X ray inactivation supports the hypothesis of a recombination mechanism."

[Author's summary.]

3645 TILL, J. E. & POLLARD, E. C.

Effects of ionizing radiation on cross-reactivation of T1 bacteriophage.

Radiation Res. 1958 : **8** : 344–60.

"Cross reactivation has been shown to occur for mutants of T1 bacteriophage that have been inactivated by exposure in the dry state to various kinds of ionizing radiation. A host-range mutant and four different plaque-type mutants were used. The ability of the irradiated phage to be cross-reactivated has been found to have a sensitivity to ionizing radiation which is 0·6 ± 0·1 of the sensitivity observed for the ability of the phage to undergo independent multiplication. This ratio appears to be insensitive to the experimental conditions used. The results may be interpreted as indicating that about 60% of the material associated with the ability to multiply independently is involved in the cross-reactivation process. The possible significance of this finding is discussed".

[Authors' summary]

3646 **(A conference on inheritance and variability in plants, animals and microorganisms).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : p. 151. [Russian].

The titles of some papers read at a conference, organized by the Genetics Institute of the USSR Academy of Sciences in October 1957, are given.

3647 PUŠKARSKIJ, S. D.
(A conference of heredity and variability in plants, animals and microorganisms).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 75–77. [Russian.]

This is a further report on the above conference [cf. 3646].

3648 HAYMAN, B. I.
The theory and analysis of diallel crosses. II.
Genetics 1958 : **43** : 63–85.

The method of diallel analysis described by the author in an earlier paper [XXV, 2625] is extended to include F_2 families and to discriminate between some of the more complicated genetic systems that may arise. The additional information provides a far better estimate of the components of genetic variation.

General principles for designing diallel experiments are laid down, with special reference to number of replications and number of duplicate families.

Epistasis of the complementary type is reported in maize and cotton. Apparent overdominance for high yield has been detected in the maize experiments considered.

3649 PATEMAN, J. A.
Back-mutation studies at the *am* locus in *Neurospora crassa.*
J. Genet. 1957 : **55** : 444–55.

Investigations which have already been briefly reported are described in detail [XXVII, 1015].

3650 SAITO, H. & TAKAHASHI, T.
Gene controlled adenine dependence epistatic to colour production in *Saccharomyces.*
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 147–52.

Apparent non-Mendelian segregation encountered in a cross between adenine independent and adenine dependent haploid strains is explained by postulating a multiple genetic control of adenine formation. One of these genes, which arose by spontaneous mutation in an originally pink adenine-dependent culture, is presumed to block adenine synthesis prior to those already present in the stock. The postulated ad_3 mutation is not linked with the other adenine genes, which, when mutant, cause color production, but is epistatic to them.

3651 PATEMAN, J. A.
Aberrant recombination at the *am* locus in *Neurospora crassa.*
Nature, Lond. 1958 : **181** : 1605–06.

In view of the anomalous production of wild types in crosses between strains carrying different *am* alleles [XXVII, 3728 and XXVIII, 9], the cross am^{29} x am^{47}, which gave the highest frequency of wild types, was repeated, the locus *am* being marked on one side by *inos* for inositol requirement and on the other by *sp* for the morphological mutant "spray". Two types of crosses were investigated, viz. (1) *sp* am^{47} x am^{29} *inos* and (2) *sp* am^{29} x am^{47} *inos*. The frequencies of the various wild types did not correspond with those expected according to the hypothesis that such genotypes are produced by crossing over of the classical type. Both crosses gave rise to a significant excess of *sp* genotypes, although this was more extreme in (1). The excess did not appear to be due to a viability effect or selective advantage. All the nonspray recombinants were derived from (2), in which the + allele was combined with am^{47} in one of the parents. The *inos* marker, when introduced into a cross in conjunction with am^{47}, as in (2), tended to be in excess frequency among the recombinants for locus *am*. The wild genotype for all three loci was not recovered. It is hoped that extensive test crossing of the aberrant recombinant wild types and study of further am^{29} x am^{47} crosses involving other linked markers will elucidate the situation.

3652 CASE, M. E. & GILES, N. H.
Evidence from tetrad analysis for both normal and aberrant recombination between allelic mutants in *Neurospora crassa.*
Proc. nat. Acad. Sci. USA 1958 : **44** : 378–90.

"A new group of 37 pantothenicacid-requiring mutants has been obtained from control, X-irradiated, and ultraviolet-irradiated macroconidia of *N. crassa* by means of the filtration-concentration technique. These mutants are all blocked in the same step in pantothenic acid biosynthesis—the conversion of ketovaline to ketopantoic acid. All 37 mutants are located in linkage group VI between the *ad*-1 and the *tryp*-2 loci and can be considered as alleles at the *pan*-2 locus.

"Despite their biochemical and genetical similarities, certain mutants can complement to form pantothenic acid-independent heterocaryons. A tetrad analysis has been performed on a cross of two such mutants (B5 x B3) carrying linked markers on either side of the *pan*-2 locus. In a total of 939 complete tetrads, exceptional behaviour of the pan mutants was noted in 11 asci. On the basis of both heterocaryon and genetic tests, four different types of exceptional asci were obtained having the following isolate ratios: (1) two asci—1 wild type: 1B3 : 1B5: 1 double B5 B3; (2) four asci—1 wild type: 1B5 : 2B3 : (3) two asci—1 wild type: 1B3 : 2B5; and (4) three asci—1B5 : 3B3. In the two asci of type 1 the adjacent linked markers indicate that the B3 and B5 isolates are non-crossover (parental) types, while the wild types and the B5 B3 doubles are reciprocal single crossover types. This evidence is taken to indicate that the *pan*-2 'locus' can be separated into two regions on the basis of genetic (crossover) as well as functional (heterocaryon) tests.

"Possible explanations for the three additional types of exceptional tetrads—those with one wild type but no double B5 B3 or with a 3 : 1 ratio of mutant types—have been considered. Cytological and genetical evidence argues against an explanation based on heteroploidy. The origin of the three aberrant tetrad types is attributed to some kind of 'copy-choice' mechanism which results in irregular segregations for either the B5, the B3, or both the B5 and B3 regions simultaneously. Such 'copy-choice' events appear to be correlated with specific patterns of conventional crossing over in the immediate vicinity of the *pan*-2 locus."

[Authors' summary].

3653 Little, T. M.
Gene segregation in autotetraploids. II.
Bot. Rev. 1958 : **24** : 318–39.

In presenting a second instalment to his previous review [XV, 910], the author surveys the literture published since 1944, together with a few relevant papers of fundamental importance appearing earlier. Theoretical treatments of the subject are first considered. Studies of autotetraploid segregation in lucerne, potato, maize, *Lythrum salicaria*, spinach, *Phleum pratense*, rice, *Canna* and *Saccharomyces* are then examined. Other sections deal with the segregation and action of incompatibility genes, fertility and the phenotypic expression of genes in autotetraploids.

3654 Whitfield, J. F. & Appleyard, R. K.
Recombination and phenotypic mixing during phage growth in strains of *Escherichia coli* doubly lysogenic for coliphage lambda.
Virology 1958 : **5** : 275–90.

"Strains of *Escherichia coli* C112 doubly lysogenic for genetically marked strains of coliphage lambda were prepared by superinfection of singly lysogenic bacteria. A particular recombinant constituted about one half of the total phage in mass lysates resulting from spontaneous and UV-induced lysis of all strains. This recombinant carried the clear plaque marker of the first prophage to be established within the cell and the host range marker of the second prophage. Both the clear marker and the host range marker of this recombinant were independently in excess of their respective alleles. It is concluded that in lambda double lysogens both prophages establish and maintain a definite orientation with respect to one another and to the neighbouring bacterial nuclear structures and that this is reflected in the type of phage released following lysis.

"In all lysates there was a poor correlation between the proportions of host range genotypes and phenotypes. Although the relative proportions of the host range markers fluctuated with the order of lysogenization by the prophages bearing them, the proportion of h^+ phenotypes was invariably higher than that of *h* phenotypes. Order of lysogenization exerted no influence on phenotype proportion. Association of individual host range genotypes with noncorresponding phenotypes, that is, phenotypic mixing was observed in all lysates."

[Authors' summary].

3655 Strickland, W. N.
Abnormal tetrads in *Aspergillus nidulans*.
Proc. roy. Soc. : Ser. B : 1958 : **148** : 533–42.

Out of six tetrads in which one or more alleles segregated in unusual ratios the results with two can be explained in terms of an extra mitotic division of one or two products of meiosis with corresponding loss of others.

"A third tetrad has 3 : 1 ratios with respect to two adjacent linked markers. These two markers entered the cross in the *trans* arrangement, and the ratios in the ascus were 3 : 1 for one marker and 1 : 3 for the other one. It is suggested in agreement with Mitchell [XXVI, 946] that such a tetrad could arise if a section of chromosome covering an interval of at least

9 units produced two daughter chromosomes instead of the usual one. In a section of a chromosome marked only at one locus, a process of this kind would lead to a 3 : 1 ratio for the alleles at that locus. The three remaining tetrads which gave 3 : 1 ratios at one locus might well have such an origin. An alternative possibility would be Lindegren's 'gene conversion', i.e. the directed mutation of an allele to the alternative allele in a heterozygote."

[From author's summary].

3656 FREESE, E.

The correlation effect for a histidine locus of *Neurospora crassa*.

Genetics 1957 : **42** : 671–84.

"A genetic study involving three closely linked histidine requiring mutants and three other linked markers has been undertaken. Histidine independent heterocaryons (or pseudowilds) between any two histidine mutants have not been found. Crosses between any two different histidine mutants yield rare histidine independent progeny while self-crosses do not. The recombination frequencies suggest an order for the three histidine markers with respect to each other. The histidine independent progeny contains parental and both recombinant types of outside markers with about equal frequency. These results cannot be explained by classical genetics. A reason has been given why the events occurring in small regions of intimate pairing and resulting in the observed correlation effect seem not to involve mutation-like phenomena but rather the insertion of chromosomal pieces, replicated along one parent, into the homologous chromatid. How the incorporation of this piece comes about is a question of more specific models, some of which have been mentioned in the introduction. A model-independent rule for ordering pairs of isolocal markers with respect to the outside markers has been given which is similar to the rule of classical genetics."

[Author's summary].

3657 TRAUTNER, T. A.

Untersuchungen an Heterozygoten des Phagen T1. (**Investigations on heterozygotes of phage T1**).

Z. VererbLehre 1958 : **89** : 264–71.

Various three-factor crosses were made with T1 phage; heterozygotes for the middle markers were selected and the combinations of the side markers were analysed. It was found that the majority of heterozygotes were recombinants with respect to their side markers as shown by Levinthal for phage T2 [cf. XXIV, 2725]. Other results and conclusions are stated as follows: "Among the heterozygotes nonrecombinant for the side markers only a fraction could be accounted for by the participation of recombinants in their formation. The majority of such heterozygotes with a parental combination of markers arose from matings between parental structures. The fraction of such nonrecombinant heterozygotes from matings between parental types was proportional to the distance between the middle and side markers employed in the cross.

"The structure of a heterozygote to satisfy the experimental results equals the one previously suggested by Levinthal in so far as it is haploid, with diploidy due to an overlap in the heterozygous region. It however, differs from Levinthal's model as it can carry a recombination in the haploid region as a result of a recombination act which had occurred during the establishment of heterozygosity in the phage concerned."

3658 WALLACE, M. E.

Experimental evidence for a new genetic phenomenon.

Phil. Trans. : Ser. B. : 1958 : **241** : 211–54.

A fuller account than those already published of the evidence supplied by mouse genetics for the phenomenon of affinity is provided. The use of quasilinkage data for locating the centromere is also illustrated. [Cf. XXIV, 11 and XXVIII, 1129].

3659 CHARLES, D. R.

The fiducial limits of tetrad-rank frequencies.

Genetics 1957 : **42** : 729–34.

Weinstein [VII, 99] derived expressions for maximum-likelihood estimates of cross-over rank frequencies in the universe of tetrads from which a sample of strands was derived. Consider now the frequencies of tetrads of rank 0, 1, 2 . . . . . $k+1$ with regard to the total number per tetrad, assuming random recurrence and no sister-strand crossing over; then all possible sets of tetrad frequencies may be thought of as lying within a k-dimensional unit-edge hypercube, occupying a "corner" of volume $1/k$ . . Sets of points representing equally likely sets of rank frequencies will lie in successive hyperellipsoidal shells, likelihood decreasing outwards from the point of maximum likelihood. The fiducial limits for the set of tetrad frequencies for which (1) the average number of cross overs per tetrad is least, (2) the average number of cross overs per tetrad is greatest, and (3) the average number of cross overs per tetrad, including tetrads one rank higher than the highest observed strand rank, is greatest are derived for specified degrees of probability.

3660 Rifaat, O. M.
A possible inversion in the mating-type chromosome of *Neurospora crassa.*
Genetica 1958 : **29** : 193–205.

The author gives recombination values and map distances from the centromere for the loci *arg*-3, *mt* (mating type), *nic*-1 and *albino*-2. In some strains *arg*-3 is distal to *mt* with respect to the centromere but in others the two loci are in the reverse order. It is concluded that the reversed order is due to inversion.

3661 Ito, T.
(The theory of crossing over).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 189–93. [Japanese].

A correspondence has been found between the distribution of cross overs along the X chromosome and the position of the centromere in *Drosophila melanogaster* and the curve given by Schrödinger's equation for a one-dimensional simple harmonic oscillator in quantum mechanics for $n = 3$.

3662 Goldschmidt, R. B.
Genetic conversion in *Oenothera*?
Amer. Nat. 1958 : **92** : No. 863 : 93–104.

The work of Renner and Oehlker on *Oenothera* crosses involving the *cruciata* character is reviewed. It is suggested, on the basis of recent findings in *Drosophila*, that apparent conversion may actually be unequal crossing over in a duplication.

3663 Rowlands, D. G.
The control of chiasma frequency in *Vicia faba* L.
Chromosoma 1958 : **9** : 176–84.

V. faba vars. *major* and *minor* did not differ in respect of chiasma frequency. Little variation in chiasma frequency was detected within plants but variation between plants was appreciable. Comparison of intracell and intercell variances led to the calculation of a wide range of correlations between (1) chiasma frequency among the small (m) bivalents and (2) chiasma frequency of the large (M) bivalent and total chiasma frequency of the m bivalents. Analysis of chiasma frequency per bivalent indicated that both the m and M chromosomes were affected by interference. It is suggested that negative correlation of chiasma frequency among bivalents occurs only when reproduction of the chromosomes is precipitated or pairing delayed, so that the degree of pairing may be influenced in species with long or many chromosomes. Such correlations do not affect recombination but may be interpreted as the occasional outcome of the mechanism controlling chiasma frequency.

3664 Cicin, N. V.
(The questions of theory and practice in distant hybridization).
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1957 : No. 6 : 733–42. [Russian].

The article is substantially the first part of an address which has already been summarized [1408].

3665 Winge, Ö.
Wilhelm Johannsen: the creator of the terms gene, genotype, phenotype and pure line.
J. Hered. 1958 : **49** : 83–88.

To mark the centenary of his birth, an account is given of the career of Johannsen and of his achievements in the study of variation.

3666 Dubinin, N. P.
(Some philosophical problems of modern genetics).
Bjull. Mosk. Obšč. Ispyt. Prirod. (Bull. Moscow Soc. Nat.) : Otdel. biol. (Biol. Ser.) : 1957 : **62** : No. 5 : 11–17. [Russian].

Evidence indicating the unique role of DNA in heredity is outlined. The importance of mutations induced by radiations and chemical agents is elucidated. The "quantum" theory of gene mutation is however discountenanced, cases being quoted from the literature in which the type of mutation differed according to the mutagenic agent employed.

3667 Strauss, B. S.
The genetic effect of incorporated radioisotopes: the transmutation problem.
Radiation Res. 1958 : **8** : 234–47.

After referring to the literature on the above problem, the author concludes that "transmutation techniques are useful for biological purposes but they do not necessarily give definite information about the molecule whose destruction is responsible for a particular biological event. Results indicating that either P^{32} or S^{35} disintegration has the same type of effect need not be considered contradictory since in neither case does the molecule affected have to be the one into which the isotope was built." The transmutation technique does however make it possible progressively to inactivate selected regions of cells, these regions being selected by the presence of particular molecules.

3668 Litt, M., Marmur, J., Ephrussi-Taylor, H. & Doty, P.
The dependence of pneumococcal transformation on the molecular weight of deoxyribose nucleic acid.
Proc. nat. Acad. Sci. USA 1958 : **44** : 144–52.

"Exposure of solutions of transforming factor [from *Diplococcus pneumoniae*] to 9-kilocycle sound waves causes scissions of the molecules with a concomitant fall in transforming activity. The addition of S-(2-aminoethyl) isothiuronium bromide hydrogen bromide during sonic treatment eliminated inactivation of transforming factor by secondary effects. By plotting the logarithm of the relative transforming activity of the sonic fragments versus the reciprocal molecular weight, and analyzing the curves by the conventional target theory, the critical molecular weight for streptomycin, erythromycin, and micrococcin was found to be 1·0 million. The value may reflect either the minimum size required for effective attachment to a bacterial site [in transformation to resistance to each of these antibiotics] or a combination of this and the minimum size required for genetic incorporation following entrance into the bacterial cell." [Authors' summary].

3669 Uetake, H., Luria, S. E. & Burrous, J. W.
Conversion of somatic antigens in *Salmonella* by phage infection leading to lysis or lysogeny.
Virology 1958 : **5** : 68–91.

"The conversion of *Salmonella anatum* (group E_1, somatic antigens 3, 10) to group E_2 (antigens 3, 15) by infection with phage ϵ^{15} and its virulent mutant ϵ^{15} *vir* has been analyzed. Antigen 15 appears in the cells within a few minutes after infection with either phage. The receptors for another phage, ϵ^{34}, which can be adsorbed only by cells with antigen 15, appear with the new antigen. The receptors for phage C_{341}, which is adsorbed only by cells with antigen 10, disappear following infection. In the early stages the cells have both antigens 10 and 15 and both sets of phage receptors. The cells that survive infection segregate lysogenic and non lysogenic cells in their progeny. In the non lysogenic segregants the changes in antigenic structure and in phage receptors initiated by phage infection persist for several generations; later the cells revert to the typical E_1 condition. The results indicate that the converted characters are controlled by vegetative phage as well as by prophage. Their bearing on the mechanism of conversion is discussed."
[Authors' summary].

3670 Groman, N. B., Eaton, M. & Booher, Z. K.
Studies of mono- and polylysogenic *Corynebacterium diptheriae.*
J. Bact. 1958 : **75** : 320–25.

Observations on phage production by lysogenic *C. diptheriae* strains C4(β), C4(γ) and C4(γ)(β) are reported. The polylysogenic strains responded more favourably to ultraviolet induction than the monolysogenic strains. Both phages and their recombinants were generally yielded by single bursts of C4(γ)(β); the occurrence of recombination indicated that lysogenic conversion to toxicity is mediated by a discrete genetic unit of the phage.

3671 Loutit, J. S.
A transduction-like process within a single strain of *Pseudomonas aeruginosa.*
J. gen. Microbiol. 1958 : **18** : 315–19.

"A process of genetic transfer, which could be demonstrated with culture filtrates of a strain of *Pseudomonas aeruginosa*, is described. The evidence indicates that genetic material was transferred in association with a large particle and that the process was similar to Salmonella transduction except that in the present case it occurred spontaneously between mutants of a single strain." [Author's summary].

3672 Horváth, J.
A faj keletkezésének néhány kérdése a Streptomyceseknél. (**Some questions of species formation in *Streptomyces***).
Agrártud. Egy. agron. kar. Kiad. 1957 : **5** : 1–11. [From: Hungar. agric. Rev. 1958 : **7** : p. 1.] (Abst.)

It is reported that by adding the sap of a non-pigment-forming *Streptomyces* species to the liquid culture medium of a pigment-forming species, the latter was transformed into a species closely resembling the former in the course of twelve passages.

3673 Schecroun, J.
Sur la réversion provoquée des souches s^s en souches s chez *Podospora anserina*. (**On the induced reversion of s^s strains to s strains in *P. anserina***).
CR Acad. Sci., Paris 1958 : **246** : 1268–70.

Type s^s strains could be induced to revert to type s [cf. XXIV, 1679] by growing them in contact with the latter, allowing anastomoses to occur between filaments of the two strains; nuclear migration did not take place. A single anastomosis was sufficient to induce the transformation of an entire mycelium.

3674 Borek, E. & Ryan, A.
The transfer of irradiation-elicited induction in a lysogenic organism.
Proc. nat. Acad. Sci. USA 1958 : **44** : 374–77.

Transference of ultraviolet-induced lysogenesis from donor cells of *Escherichia coli* to receptor cells was effected only during conjugation. The cross induction was unidirectional, the transference being only from F^+ to F^- cells. The initial impact of the irradiation did not appear to affect the prophage but to alter some component of the cell other than the genetic material.

A discussion on the cytoplasm in variation and development.
Proc. roy. Soc. : Ser. B. : 1958 : **148** : 285–369.

The following papers presented at this meeting will be of interest to plant breeders.

3675 *Catcheside, D. G. Introduction.* (*pp. 285–90*).

In this introductory paper the speaker emphasized the importance of nuclear-cytoplasmic interaction. The cytoplasm is the medium through which the characters determined by the genes are expressed while at the same time the character of the cytoplasm of mature, differentiated cells is related to the functions of the cells. Germ cells always contain undifferentiated cytoplasm since in plants they are derived from meristematic cells and in animals from embryonic cells. Examples discussed of studies of cytoplasmic variants and their inheritance include the petite form in yeast [XXIII, p. 656] and the poky form of *Neurospora* [XXIII, 947, XXVI, 2030, XXVII, 1053 and 1056]. It is concluded that these examples provide evidence of the existence of altered cytoplasmic particles capable of determining their continued reproduction in the cell. The iojap form of maize [cf. XIV, 850] is cited as an example of a cytoplasmic change caused by a recessive gene substitution persisting after the causative gene has been lost, and involving both reproductive and somatic cells.

3676 *Jinks, J. L. Cytoplasmic differentiation in fungi.* (*pp. 314–21*).

A method of distinguishing between differences of nuclear or cytoplasmic origin is described [XXV, 727 and XXVII, 79], as are further tests enabling cytoplasmic changes to be classified [XXVIII, 35]. Two groups of cytoplasmic differences occur, spontaneous and induced, and in the latter group two types can be recognized, adaptive and mutant. The adaptive occurs in the presence of an external stimulus and is characterized by an improved performance in the presence of this stimulus and rarely survives its removal. Considerable heterogeneity has been found among the asexual spores of a homocaryotic clone of *Aspergillus glaucus* in respect of their ability to adapt to new media [XXVII, 1112] and it has been found possible to alter the proportion of asexual spores which adapt successfully to the new medium by selection among sister colonies, indicating that cytoplasmic differences for adaptive ability are heritable in the manner of those affecting other characters. Nonadaptive changes have been induced in *A. glaucus* and *A. nidulans* by ultraviolet light, acriflavine, extreme temperatures and subminimum media. Studies of the inheritance of a cytoplasmic mutation in *A. nidulans*, obtained by ultraviolet irradiation of uninucleate asexual spores, indicate the presence of more than one replica in each spore of the cytoplasmic element which mutated and that not all the replicas were affected by irradiation. In general, variations in phenotype within homocaryons and heterocaryons are thought to reflect only differences in cytoplasmic content although the range of phenotype is under nuclear restraint. A homocaryon of *A. glaucus*, designated B, is studied which shows an average variation twenty times greater after extraction from an AB heterocaryon than before passage through the heterocaryon. The mean performance of B colonies was decreased by passage through the heterocaryon. It is thought that changes in the equilibrium of cytoplasmic elements of B are involved, rather than the appearance of new elements, the homocaryon being reextracted with a cytoplasm which is not adjusted to the level of nuclear-cytoplasmic cooperation of the original homocaryon.

3677 *Sharpe, H. S. A closed system of cytoplasmic variation in* Aspergillus glaucus. (*pp.* 355–59).

A more detailed account is given of work previously summarized [XXVII, 1055].

3678 *Mahony, M. & Wilkie, D. An instance of cytoplasmic inheritance in* Aspergillus nidulans. (*pp.* 359–61).

A strain of the above fungus has given rise to a number of sexual colonies, reproducing only by conidia. Some of these revert after prolonged incubation but the majority remain asexual while the sexual colonies continue to segregate. A cross was made between a biotin independent (*BI*) conidial form with white conidia (*w*) and a biotin dependent (*bi*) perithecial form with wild-type green conidia (*W*). Perithecia were obtained resulting from three types of nuclear fusion, *Wbi* x *Wbi*, *Wbi* x *wBI* and *wBI* x *wBI*. In the third case recombination of the factor for perithecia formation occurred without cross fertilization, indicating that this factor is not directly associated with the nucleus of the perithecial strain. Similar results were obtained from crosses between perithecial and conidial strains but crosses between conidial strains never produced perithecia although hetercaryons were established. A strain was found which produced the pigmented cytoplasm characteristic of the perithecial type but was unable to produce perithecia, due to the mutation of a single gene, *s*. On crossing *wsBI* with *WSbi*, perithecia were obtained from the two fusions *WSbi* x *WSbi* and *WSbi* x *wsBI* and all recombinant classes were obtained in the progeny. It is assumed that the self-sterile strain supplied the cytoplasmic factor absent in the conidial parent, which in turn contributed the non-mutant allele, *S*, of the sterility gene. Lowering the concentration of sugar in the medium increased the number of conidial colonies in this strain, while in another strain lowering the temperature decreased the frequency of conidial colonies.

3679 *Mather, K. Nucleus and cytoplasm in heredity and development.* (*pp.* 362–69).

In drawing together the topics discussed the speaker emphasized the importance of changes in both nucleus and cytoplasm in influencing nuclear-cytoplasmic interaction, particularly those changes resulting from aging and differentiation. Although microorganisms are useful objects for the study of these problems it is not clear how far findings obtained from such studies can throw light on the behaviour of the more highly organized somata of higher plants and animals and further work on cytoplasmic variation and selection in higher organisms is needed.

3680 MICHAELIS, P.
Untersuchungen zur Mutation plasmatischer Erbträger, besonders der Plastiden. I. Teil. (**Investigations on mutation of cytoplasmic hereditary units, especially of the plastids. Part 1**).
Planta 1958 : **51** : 600–34.

The introductory chapters of this paper are concerned with a discussion of some peculiarities of cytoplasmic inheritance, reference being made to the literature and the author's own studies of *Epilobium*. On account of the large numbers of similar hereditary units per cell, it is concluded that the expression of a mutation is dependent on interaction between these units. A mutation is only immediately expressed if the factor concerned is dominant over all the corresponding normal factors in the cell. Otherwise multiplication and recombination with reference to the mutant factor is necessary before it becomes expressed in either a cell or organelle, the effect being quantitative depending on the number of mutant factors present. Many mutant factors may be eliminated, for example by selection, before they are expressed. Also the regularity of plasmon recombination depends on the number of hereditary units per cell; the frequency of discernible mutations decreases rapidly as the number of hereditary units rises, even when the mutation rate is constant. Plasmon recombination often leads to characteristic patterning of the plant organs as in *Epilobium* leaves. Recent experiments of the author involved treating *Epilobium* with radioisotopes of sulphur and phosphorus. In addition to many nuclear mutations, mutations in plastid characters were obtained, the frequency of these increasing with the dose. A small number of cytoplasmic mutants were also found.

3681 GIBSON, A. & GRIFFIN, D. M.
Cytoplasmic variation in *Nectria stenospora*.
Nature, Lond. 1958 : **181** : p. 1222.

The "tasselled" type of colony, characterized by an intricate pattern of fan-shaped areas of denser, sporulating mycelium separated by areas with reduced hyphal density and sporulation, was shown to be under cytoplasmic control by Jinks's heterocaryon test. Among the colonies derived from ascospores of the original ascus the character appeared to be determined by genes at two loci. The simulation of a two-gene effect is attributed to a fortuitous irregularity in the distribution of the cytoplasmic particles among the ascospores.

3682 KOLLER, P. C.
Genetic aspect of somatic cell variation.
Nature, Lond. 1958 : **181** : 1706–07.

Summaries are given of contributions to the eleventh Biology Research Conference, held at Gatlinburg, Tenn., during April 1958, and sponsored by the Biology Division of the Oak Ridge National Laboratory. The papers included the following. The wide range of somatic-cell variations attributable to changes in nuclear and cytoplasmic determinants were surveyed by two speakers, C. Stern and B. Ephrussi. R. A. Brink showed how specific interaction of nuclear determinants may cause somatic variation, by describing the effect of modulator activity upon mutation of a gene for pericarp colour in maize. J. W. Braun discussed competitive interactions which occur in bacterial cell populations at metabolic level and argued that similar processes may be responsible for variations within somatic cell populations. In summarizing the proceedings, J. Lederberg made an attempt to classify the molecular basis of information within the cell which determines the cellular phenotype.

3683 LE ROY, H. L.
Genetisch bedingte Variation und genetisch bedingte Korrelation zwischen Individuen in einer zufällig gepaarten Population. (**Genetically conditioned variation and genetically conditioned correlation between individuals in a randomly mating population**).
Arch. Klaus-Stift. VererbForsch. 1957 : **32** : 453–64.

An expository account is given of the derivation of expressions for genetic variance involving one or more loci and intermediate or dominant inheritance, and for genetic correlation between relatives.

3684 MOSER, H.
Structure and dynamics of bacterial populations maintained in the chemostat.
Cold Spr. Harb. Symp. quant. Biol. 1957 : **22** : 121–37.

Expressions are derived for the growth of genetically homogeneous bacterial populations in a chemostat and for the steady state eventually established. If however the "prevalent mutant" grows faster or slower than the initial type, the equilibrium is displaced. The concentration of the controlling growth factor and growth rate constants can be expressed as functions of prevalent-mutant frequency. Formulae have been derived for the accumulation of the prevalent mutant. The accumulation of infrequent mutants is difficult to treat mathematically except in special cases.

3685 MORAN, P. A. P.
A general theory of the distribution of gene frequencies. I. Overlapping generations.
Proc. roy. Soc. : Ser. B. : 1958 : No. 934 : 102–12.

"The distribution of gene frequency at a single locus in a population of diploid individuals, with two sexes, subject to mutation, non-random mating and phenotypic selection, is obtained in the case where the generations are overlapping so that individuals die one by one. This distribution is of the same form as that obtained by heuristic methods by S. Wright in a randomly mating population but the coefficients are altered both by the non-randomness of the mating and the overlapping of the generations."

[Author's summary].

3686 MORAN, P. A. P.
A general theory of the distribution of gene frequencies. II. Non-overlapping generations.
Proc. roy. Soc. : Ser. B. : 1958 : No. 934 : 113–16.

"The distribution of gene frequency at a single locus in a population of diploid individuals with two sexes, subject to mutation, non-random mating and phenotypic selection, is obtained in the case where all the population dies at the same time and is replaced by a new generation. The distribution is similar to that obtained by Wright with a correction due to the non-randomness of the mating."

[Author's summary].

3687 GATES, C. E., COMSTOCK, R. E. & ROBINSON, H. F.
Generalized genetic variance and covariance formulae for self-fertilized crops assuming linkage.
Genetics 1957 : **42** : 749–63.

The primary objective of this paper is to specify the effect of linkage in terms of generalized genetic variance and covariance formulae for self-fertilized organisms, assuming normal diploid meiosis, but excluding maternal effects, position effects, multiple alleles, mutation, selection and epistasis. In the special case where gene frequency is $\frac{1}{2}$ and there is no random mating prior to selfing, all genetic variances and covariances can be partitioned into four components representing (1) additive genetic variance, (2) dominance variance, (3) linkage effects associated with (1), and (4) linkage effects associated with (2).

3688 KIMURA, M.
On the change of population fitness by natural selection.
Heredity 1958 : **12** : 145–67.

A full mathematical account is given of the rate of increase of population fitness due to natural selection. The preliminary account of this work has been summarized already [2498].

3689 STERN, K.
Kombinationseignung hinsichtlich der Wachstums-Ergebnisse eines Modellversuches mit *Antirrhinum majus* L. (**Combining ability with special reference to the data on growth obtained in a model experiment with *A. majus* L.**).
Silv. genet. 1958 : **7** : 41–57.

Diallel crossings between 13 growth mutants of inbred line 50 were made. Growth rate was measured over the entire vegetative cycle and its genetic components were partitioned in the usual way. Growth rate varied greatly: it could be uniformly high, uniformly low, high → low or low → high in different genotypes. The fixed genetic variation was almost entirely additive. The degree of dominance of the growth genes, however, varied greatly and was not necessarily constant during the growth cycle. Suitable parameters for characterizing the overall growth cycle are proposed. The results are thought to have special applications in the analysis of the growth of forest stands.

3690 LANGRIDGE, J.
A hypothesis of developmental selection exemplified by lethal and semi-lethal mutants of *Arabidopsis*.
Aust. J. biol. Sci. 1958 : **2** : 58–68.

According to the hypothesis advanced by the author, in flowering plants survival of a deleterious mutation to the stage of germination depends upon the diffusibility of the metabolite required by the mutant and upon the ontogenetic stage at which it is required. Lethal mutants persisting after germination should therefore in general have requirements for substances with low molecular weight. To test this hypothesis, investigations were carried out on the requirements of 11 lethal and semi-lethal mutants of *A. thaliana*, ten of which resulted from X irradiation of seeds while one was spontaneous. Six responded respectively to (1) thiamin, (2) choline, (3) coconut milk, (4) sucrose or glucose, (5) an osmotic pressure of at least 1·5 atmospheres brought about by a supplement of glucose, sucrose or K_2SO_4 and (6) an alternation of temperatures for flowering. The remaining five did not respond to any supplement. Three respectively showed dwarfness due to poor embryo growth, lack of cotyledons and lack of chlorophyll in the normal-sized chloroplasts; the other two were without chloroplasts. It is considered that the behaviour of the mutants lends support to the hypothesis.

3691 ZAMENHOF, S. & DE GIOVANNI, R.
Study of survival of unstable strains of *Escherichia coli*.
J. Bact. 1958 : **75** : 514–16.

Examples are described of the following mechanisms which preserve genetically unstable strains: (1) the instability is linked with a gene conferring some selective advantage; (2) the mutation to instability occurs in a strain which has initially the ability to grow better than other strains coexisting in the same environment; (3) the increased mutation rate of the unstable strain makes possible the appearance of a favourable mutant which then overgrows the stable form, the chance of a comparable mutant occurring in the stable strain being very low.

It is suggested that "periods of accelerated evolution have coincided with the occurrence and sustentation of such genetically unstable strains".

3692 SMITH-KEARY, P. F.
An unstable mutation in *Salmonella typhimurium*.
Nature, Lond. 1958 : **181** : p. 1672.

In investigations at the University of Dublin, three types of spontaneous mutants showing a change from leucine requirement to independence were distinguished on the basis of their growth rate on a medium lacking leucine. The three types have been termed fast, slow and very slow. Fast and slow mutations were stable and could be transduced into the leucineless strain, only fast and slow clones, respectively, being obtained. The fast type is probably a true back mutation to the wild type. The slow type may be due to a suppressor mutation or to a mutation resulting in a different allele at the locus for leucine requirement. The very slow type was unstable, reverting to the leucineless condition at a very high rate. Very slow clones arising through independent mutations showed varying degrees of instability. Further experiments are in progress to determine whether the instability is confined to the leucine locus and whether a leucine-requiring strain derived from a very slow type displays any residual instability. As reported by Zamenhof *et al.*, unstable mutants have also occurred in *Escherichia coli* in experiments in which a mutagenic agent was used [2556].

3693 Alihanjan, S. I. & Mindlin, S. Z.
(Utilizing biochemical mutants of *Actinomyces rimosus* for production of hybrid forms).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **114** : 1113–15. [Russian].

Joint culture of two different mutant strains stimulated growth and terramycin production in the same way as did the addition of methionine or niacin to the substrate in previous experiments [XXVII, 3737]. In an appendix, the writer reports that recombinant mutants of *A. rimosus* were obtained.

3694 Fincham, J. R. S. & Pateman, J. A.
A new allele at the *am* locus in *Neurospora crassa.*
J. Genet. 1957 : **55** : 456–66.

The effects of mutation am^1 are described [cf. XXVII, 3668 and XXVIII, 10]. In addition, it is reported that the phenotype of am^1 is enhanced by a loosely-linked gene *i*, which was already known to interact with alleles at locus *am* to produce a more extreme aminoacid requirement and inhibition by ammonium salts.

3695 Zamenhof, S., Greer, S. & de Giovanni, R.
Study of spontaneous gene unstabilization in *Escherichia coli.*
J. Bact. 1958 : **75** : 510–13.

The Harvard strain of *E. coli* was studied and it was found that, for at least three loci, mutation to a stable mutant abolished the high mutation rate of many other unstable genes in other loci. For example a lactose fermenting form (lac^+) of the above strain shows a high level of mutability for many genes whereas the lactose nonfermenting mutant (lac^-) has lost this mutability with respect to the *lac* and other loci.

3696 Cuany, R. L., Sparrow, A. H. & Pond, V.
Genetic response of *Antirrhinum majus* to acute and chronic plant irradiation.
Z. VererbLehre 1958 : **89** : 7–13.

Two clonal lines of *A. majus* heterozygous for three genes controlling flower colour were used in these studies. Acute treatments were made with X rays at a dose rate of 340 r. per min.; chronic treatments involved irradiation from Co^{60} at dose rates varying from 0·4 to 285 r. per day. Only flowers which opened more than 15 days after acute X-ray treatment in the pre-flowering stage showed mutant spots. The number of spots induced by 1000 r. indicated an average mutation rate for the three genes studied of $6{\cdot}33 \times 10^{-6}$ per cell per roentgen. A linear response of mutation rate to daily dose rate was found with chronic γ irradiation and dose rates below 6 r. per day did not show significantly greater mutagenic efficiency than the higher dose rates.

Mutant sectors appeared in plants several months after both chronic and acute irradiation, indicating the induction of persistent genetic changes; these latter are to be further investigated.

3697 Williams, W. & Dowrick, G. J.
The uptake and distribution of radioactive phoshorus (^{32}P) in relation to the mutation rate in plants.
J. hort. Sci. 1958 : **33** : 80–95.

In experiments on potted trees of apple and pear at the John Innes Horticultural Institution, England, the rate of root uptake of solutions containing varying quantities of P^{32} in the form of irradiated sodium dihydrogen phosphate proved to be slow and the activity attained in the terminal meristems too low for this method to merit further consideration. With injection of the trunks or branches, the isotope accumulated in the terminal and spur meristems in amounts above those expected from uniform distribution and up to amounts in excess of the lethal dose. With higher numbers of buds, a greater proportion of the dose was recovered in the growing points. When a comparison was made between trees with 12 and 96 buds, doubling the administered dose for the trees with the higher number of buds resulted in approximately equivalent dose rates in the meristems. For herbaceous species the most successful method consisted of introduction of the solution through the cut end of the petiole. The upper levels of tolerance of vegetative buds of apple and floral buds of the foxglove, calculated as total activity shortly after injection, were about 50 and 12 μc. per g. dry weight respectively. If absorption is taken to be 50% and if the biological half-life at these high levels is about a half of the physical half-life, the calculated total doses at the upper levels of tolerance correspond to 11,000 and 2500 r.e.p.

3698 Matney, T. S., Shankel, D. M. & Wyss, O.
Mutations induced by ultraviolet light without attendant lethality.
J. Bact. 1958 : **75** : 180–83.

By means of small nonlethal doses of ultraviolet rays, large numbers of mutations were induced in *Escherichia coli* strain B/r at the locus controlling streptomycin resistance; the delay in the phenotypic expression of the mutants was dependent upon the dose of radiation. Photoreversal of the mutations was only possible for a short time after the ultraviolet treatment.

Small doses of ultraviolet were also used to induce high level streptomycin resistance in *E. coli* strains K-12 and W and in *Bacillus cereus*, whilst resistance to T2 phage was induced in *E. coli* strain B/r.

3699 LEDERBERG, J. & ST. CLAIR, J.

Protoplasts and L-type growth of *Escherichia coli*.

J. Bact. 1958 : **75** : 143–79.

This paper is mainly concerned with studies of L colonies of *E. coli* which may be grown from protoplasts obtained by treatment with penicillin; it is thought that penicillin inhibits synthesis of the cell wall. Fixed L forms may also develop under the influence of penicillin and these are auxotrophic mutants requiring diaminopimelic acid, a constituent of bacterial cell walls. Fixed L forms of *Proteus* are also known which responded neither to diaminopimelic acid nor to crude bacterial hydrolysate. It is suggested that spontaneous mutants with wall defects may have a selective advantage in the presence of penicillin and possible explanations of this phenomenon are considered.

Attempts to convey genetic markers to protoplasts by means of extracts containing DNA were unsuccessful.

3700 ZELLE, M. R., OGG, J. E. & HOLLAENDER, A.

Photoreactivation of induced mutation and inactivation of *Escherichia coli* exposed to various wavelengths of monochromatic ultraviolet radiation.

J. Bact. 1958 : **75** : 190–98.

Mutations to streptomycin independence in *E. coli* SD-4 and to purine independence in *E. coli* strain 82/r induced by ultraviolet rays were studied and it was found that inactivation and mutation action spectra for both strains were of the nucleic acid type with broad maxima around 2600 Å. *E. coli* 'SD-4' showed a linear mutation dose response at all the wave lengths tested but *E. coli* 82/r had exponential mutation dose curves. Photoreactivation of inactivation and mutation in both strains occurred after exposure to ultraviolet wave lengths of 2378 to 2967 Å and the proportion of the ultraviolet effect that could be photoreactivated was greater for mutation than for inactivation in SD-4.

3701 VAN ARKEL, G. A.

Modification of ultraviolet and formaldehyde mutagenesis in *Aspergillus nidulans*.

Proefschr. Rijksuniv. Utrecht 1958 : Pp. 79.

In addition to providing an extensive review and discussion of this topic, the author describes work of his own which largely confirms results previously reported by other workers. It is concluded that ultraviolet irradiation produces relatively stable mutagenic chemicals, some of which are peroxides. The frequency of induced mutations is increased by treatment with formaldehyde either before or after irradiation, the effect being shown irrespective of radiation dose and it is suggested that radiation favours the production of free, mutagenic formaldehyde radicals. The mutagenic activity of various peroxides and formaldehyde and their effect on the activity of various chemicals have been investigated. In a genetical study of acriflavine-resistant mutants it was found that three morphologically distinct types occurred and that about 75% of the mutations occurred at one locus, several alleles being involved.

3702 MATSUSHIMA, T. & KLUG, R. J.

Utilization of L-sorbose by monosporidial lines and mutants of *Ustilago maydis*.

Amer. J. Bot. 1958 : **45** : 165–68.

Two sexually compatible monosporidial lines 10A4 and 17D4 and the diploid line 410qq isolated from a cross between 10A4 and 17D4 could be differentiated by their abilities to metabolize l-sorbose in the presence of various sources of nitrogen. Line 410qq was intermediate to 10A4 and 17D4 in its ability to utilize l-sorbose and it is thought that genes controlling this capacity may have been interacting. Mutants of 17D4 induced by α radiation could also be differentiated in l-sorbose media. No relationship was found between utilization of l-sorbose and sexual compatibility in 43 other haploid lines.

3703 SYMONDS, N.

The properties of a star mutant of phage T2.

J. gen. Microbiol. 1958 : **18** : 330–45.

"The properties of a plaque-type variant, or 'star' mutant of coliphage T2 are investigated. This mutant forms sectored plaques which are composed of approximately equal numbers of the parental star phage particles and of rapid-lysing (r) mutants. The star mutant is shown to be a one-step mutant of wild-type possessing a mutation at a locus, s_1, that is close to the r_1 locus of phage T2. The r mutants occurring in the star plaques are all double-mutants, containing as well as the s_1 mutation, a mutation at some further r locus. Rapid-lysing mutants isolated from different star plaques possess r mutations at different loci. The high proportions of r mutants occurring in the star plaques is due to selection of r mutants that are formed spontaneously during replication of the star phage. This selection occurs during phage multiplication in *Escherichia coli* that is no longer multiplying exponentially (old bacteria), but not in exponentially growing bacteria. The slow multiplication of star compared to r phage in old cultures of *E. coli* is not due to an inability of the old bacteria to synthesize star phage particles at the same rate as r phage particles but is caused by two, probably related, factors. First, the star phage has a prolonged latent period in old bacteria, and secondly, the star phage particles that are eventually released when the old cells lyse re-adsorb very slowly to old bacteria in the culture. During multiplication in old bacteria the r phage therefore goes through many more cycles of growth than the s phage, and thus accumulates more rapidly."

[Author's summary].

3704 McFall, E. & Stent, G. S.
Three star mutants of coliphage T2.
J. gen. Microbiol. 1958 : **18** : 346–63.

"Star mutants of coliphages produce irregularly-shaped plaques which harbour mixed phage clones consisting of two or more phage genotypes: one type which forms star plaques identical in morphology and genetic constitution to those of the primary star mutant and other types which form regular genetically-homogeneous plaques. The peculiar morphology and genetic hererogeneity of star plaques is due to the appearance and subsequent selection in every such plaque of secondary mutants with growth properties superior to those of the primary star mutant. In the present work, the genetic structure of three such primary star mutants of coliphage T2 and of the secondary, regular mutants which they sport has been examined. The 'bromouracil' star mutant s_8 owes its star character to a single mutation at a locus s_8 which is not closely linked to any known genetic marker of coliphage T2. The secondary, regular mutants found in every plaque of s_8 harbour *reverse mutations* to s_8^+ wild-type at the mutated star locus itself. The 'extended-host-range' star mutant h' owes its star character to the h' allele of the host range locus h. The secondary, regular mutants found in every plaque of h harbour *suppressor* mutation to h at a definite locus i_1 closely linked to h. These suppressor mutations abolish only the star effect of the h' allele without affecting the extended-host-range conferred by h' upon the coliphage T2. The 'P^{32}-decay' star mutant hr_s harbours a mutation r_s which extends over a considerable sector of the T2 genome situated between the distantly linked loci r_7 and r_1. The star phenotype of this mutant derives from an interaction between the host-range locus h and the r_s mutation so that some genetic states of the host range locus confer poor plaque development on phage particles in which they exist in conjunction with r_s. The secondary, regular mutants found in every plaque of hr_s harbour one of a set of non-allelic h^+ or ht mutations in the h locus which abolish the plaque growth-inhibiting interaction of h with the r_s mutation and which also affect the host range. It is possible to replace variable sectors of the r_s mutation proximal to r_7 with their r^+ alleles by crosses of hr_s to wild-type. One may suppose that star mutants should be encountered with all those plaque-forming virus types which can sport with sufficiently high probability, i.e. soon enough during the development of each plaque, secondary mutants of growth characteristics superior to those of the parent type".

[Authors' summary].

3705 Alikhanian, S. I. & Iljina, T. A.
Mutagenic action of actinophages.
Nature, Lond. 1958 : **181** : 1476–77.

Further investigations have shown that actinophages differ in the spectrum of mutation for colony type which they induce in *Actinomyces olivaceus* [XXVII, 3673]. Biochemical mutants were also induced by the single actinophage tested for its effect in this respect.

3706 Loveless, A.
Increased rate of plaque-type and host-range mutation following treatment of bacteriophage *in vitro* with ethyl methane sulphonate.
Nature, Lond. 1958 : **181** : 1212–13.

Treatment of phage T2 *in vitro* with ethyl methane sulphonate resulted in an increase in the number of mutations to the genotypes r and h in the first cycle of infection of *Escherichia coli.*

3707 IYER, V. N. & SZYBALSKI, W.

The mechanism of chemical mutagenesis. I. Kinetic studies on the action of triethylene melamine (TEM) and azaserine.

Proc. nat. Acad. Sci. USA 1958 : **44** : 446–55.

The above two substances are particularly suitable for the quantitative evaluation of mutagenic processes, because within the wide limits of effective concentration the survival of treated cells is close to 100%. Investigations were carried out on their effects upon reversion of the mutations *sd-4* (streptomycin dependence) and *cys-2* (cysteine requirement) in *Escherichia coli*. The relationship between the logarithms of concentration of each mutagen and number of reversions was almost linear, the "plateau" characteristic of the effect of $MnCl_2$ being absent. With 10 μg./ml. of TEM, an almost linear mutational response was obtained for times of treatment ranging from 10 min. to 3 or 4 days at 32° C.; after this period the curve levelled off. The maximum number of over 10^4 mutants per 10^8 surviving cells induced by TEM was identical at 2° and 32° C., although the rate of appearance of the mutants was much lower at 2° than at 32° C. The maximum effect of azaserine 5 μg./ml. was attained in 10–20 hr. At 2° C., the final number of mutants induced by the substance was somewhat lower than at 32° C. The effect of retreatment with freshly prepared mutagen was investigated, to examine the possibility that the mutagen might be used up or decay during treatment and that its revival might enhance the mutagenic response. Such retreatment had no effect upon the action of TEM but increased the mutagenicity of azaserine by a factor of 3–4. In experiments in which the mutagen was removed from the cell environment and replaced by distilled water or various salt solutions at 32° C., the number of mutants was not reduced but even tended to increase during the first four hours of the post-treatment. Exposure to TEM for only 1½ hr. at 2° C. was sufficient to obtain the subsequent full expression of mutagenicity at the same temperature in the absence of the mutagen, in distilled water. Transfer to distilled water at 32° C., however, caused partial loss of the effect of TEM, presumably as the result of secondary decay of a mutagen-cell complex. Attention is drawn to the intricate nature of the mutagenic response, with regard to the participation of the postulated steps of (1) diffusion and (2) semireversible binding, which are rapid even at low temperatures, and (3) a temperature-dependent reaction which proceeds at a comparatively low rate in a nutrient-free aqueous medium.

3708 BENZER, S. & FREESE, E.

Induction of specific mutations with 5-bromouracil.

Proc. nat. Acad. Sci. USA 1958 : **44** : 112–19.

"A set of spontaneously arising *r*II mutants of phage T4 is compared with a set of mutants induced by the action of 5-bromouracil. When analyzed by genetic mapping techniques of high resolution, the two sets of mutants are found to be quite different. The mutagen does not merely enhance the over-all mutation rate but acts at specific locations in the hereditary structure.

"The induced mutants are mostly of the nature of small, revertible alterations rather than gross defects. The reversion rates of induced mutants are less varied than those of spontaneous mutants, indicating that a certain class of molecular transition is involved.

"These preliminary results encourage the hope that this sort of genetic analysis can lead toward an understanding of the mechanism of mutation and the identification of the specific chemical configurations composing the genetic structure.

"The occurrence at a given location of one mutation in the induced set corresponds to roughly 10^3 times higher mutability of this spot in 5-bromouracil than is indicated by the occurrence of one mutation in the spontaneous set." [Authors' summary].

3709 DOUDNEY, C. O. & HAAS, F. L.

Modification of ultraviolet-induced mutation frequency and survival in bacteria by post-irradiation treatment.

Proc. nat. Acad. Sci. USA 1958 : **44** : 390–401.

Using mutants of *Escherichia coli* showing an aberrant colonial colour on Difco eosin-methylene blue agar [cf. 1169] and a tryptophane-requiring mutant of this bacterium, the effects of absence of energy source (glucose), temperature, nitrogen deprivation, chloramphenicol, nucleoside antagonists, and purine and pyrimidine ribosides during postirradiation incubation were investigated. The results led to the following hypothesis. (1) The principal mutagenic effects of ultraviolet rays consists of modification of RNA precursors present in the cell at the time of irradiation. (2) The modified precursors are stabilized in the cell by an enzymatic process dependent on a source of aminoacids, this process corresponding to "mutation stabilization". If the precursors are not stabilized, they are rapidly removed or lose their capacity to bring about mutation by a second enzymatic process resulting in "mutation-frequency decline". (3) Mutation is brought about by incorporation of the modified nucleic-acid precursors in RNA synthesis, a modification of the RNA or "mutation fixation" being the result. The evidence suggests that concurrent synthesis of RNA and protein is directly involved. (4) The nature of the relationship, if any, between modification of RNA and modification of the DNA constituting the genetic material is not yet known.

3710 Northrop, J. H.
Concerning the origin of bacterial viruses.
Proc. nat. Acad. Sci. USA 1958 : **44** : 229–35.

The author reports the following results in support of his view that the production of bacteriophage is a genetic property of the host cell and that the change from a normal to a phage-producing cell is a bacterial mutation. The frequency of terramycin-resistant cells and of phage-producing cells of *Bacterium megaterium* was increased by exposure to ultraviolet radiation or by culture in media containing low concentrations of hydrogen peroxide. The increase was shown to be due to a rise in the rate of mutation and not merely to change in growth rate or number of virus particles produced by the cell. The rate of appearance of the phage-producing cells was in agreement with the results of equations for predicting the rate of appearance of terramycin-resistant mutants.

3711 Wilson, L. G.
Relative effectiveness of various wavelengths of ultraviolet in inducing biochemical variants in *Penicillium chrysogenum* NRRL 1951.
Diss. Abstr. 1957 : **17** : Publ. No. 24,340 : p. 2399. (Abst.)

A total of 202 biochemical variants was obtained from 9163 colonial isolates from spores surviving exposure to 2534, 2750, 2900 and 2950 Å. With increasing dosages the frequencies of mutants increased to maxima of 2·8–4·5% and then declined. The maxima occurred at dosages allowing 20% survival of the spores after treatment with 2534, 2750 and 2900 Å and at a dosage which allowed 3% survival after exposure to 2950Å. A secondary rise in the percentage of mutants was observed with continued exposure to 2534 Å. Treatment with 2534 or 2950 Å. was about one-third more effective than irradiation with 2750 or 2900 Å. The effectiveness of 2950 Å. suggests that absorption by nucleic acid is not a prerequisite to the induction of biochemical variants. About 50% of the mutants had single requirements for a wide range of aminoacids, the most frequent deficiencies being for methionine, arginine, adenine, lysine or histidine. Dosage and wavelength had no effect upon the types of mutants [cf. XXI, 1636].

3712 Demerec, M. & Sams, J.
Dose-effect relationships for X-ray induction of mutations in three genes of *Escherichia coli*.
Science 1958 : **127** : p. 1059. (Abst.).

The spontaneous rates of reverse mutation to prototrophy per 10 bacteria for *ar-3* (arginineless), *me-2* (methionineless) and *thre-1* (threonineless) were respectively 10·8, 15·6 and 2·3. Doses of X rays doubling these rates were 68 r. for *ar-3*, 186 r. for *me-2* and 85 r. for *thre-1*. The lowest dose used was 8·5 r. with *ar-3* and 17 r. with the other two genes; the highest dose was 4320 r. In the case of each gene the data indicated a linear dose-effect relationship, no threshold being indicated. According to these results, natural radiation could account for only a small proportion of spontaneously occurring mutations.

3713 Grigg, G. W.
Competitive suppression and the detection of mutations in microbial populations.
Aust. J. biol. Sci. 1958 : **2** : 69–84.

Data on *Neurospora* which formed the basis of a previous brief report [XXII, 1678] are presented in detail. In addition, evidence is given suggesting that suppression of the growth of prototrophs of *Neurospora* by high concentrations of auxotrophs under conditions commonly employed in back-mutation experiments is due to the removal of sugar from the minimal medium by nongrowing auxotrophic conidia, insufficient free sugar being left for the growth of prototrophic conidia if a sufficient number of auxotrophs is present. According to experimental data, other factors which may bias back-mutation experiments are interaction between prototrophic and auxotrophic nuclei within multinucleate conidia and the proportion of dead cells in the conidial population plated. Both factors operate to enhance the germination and growth rate of prototrophic conidia. Those factors may act synergistically with, or independently of, competitive suppression, thereby biasing estimates of the proportion of mutants in a population. The author concludes with a review of the literature, indicating that competitive suppression is of widespread occurrence in microorganisms.

3714 Maton, K.-Š. [Mathon, C.-C.]
(A crucial stage in the history of biology).
Agrobiologija (Agrobiology) 1957 : No. 6 : 145–49. [Russian].

A conference at Rennes dedicated to the centenary of the birth of Lucien Daniel, with graft hybridization as the main topic, is reported. The writer accepts inheritance of acquired characters and other tenets of Mičurin-Lysenko genetics, though some other members of the conference did not. Mention is made of a vegetative hybrid of *Capsicum*/*Datura tatula* obtained by Pichenot at Marseilles. The sexual progeny of the hybrid has a different chromosome number from the initial *Capsicum* variety and shows an improvement in some economic properties.

3715 Kružilin, A. S.
(The present state and prospects of studying mutual interaction between stock and scion in plants).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 455–63. [Russian].

A review of research, including the writer's own experiments on vegetative hybridization, is presented [cf. XXIV, 739]. It is thought that a more profound integration of the two components occurs in intraspecific graft hybrids than when the components represent two different species. Hybrids of the first kind usually transmit acquired characters to their seed progeny, whereas heritable changes in distant graft hybrids cannot be obtained without supplementary grafting and selection.

3716 Gluščenko, I. E.
(The progress of research on vegetative hybridization).
Agrobiologija (Agrobiology) 1957 : No. 5 : 106–18. [Russian].

Some of the more recent research on graft hybridization in plants and animals carried out in many countries is reviewed. The author considers that sufficient evidence has been obtained in support of the thesis that inheritance of acquired characters occurs.

3717 Kraevoj, S. Ja.
(The question of the inheritance of changes induced by grafting).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **116** : 1022–25. [Russian].

Experiments with potato, tomato, tobacco and other plants showed that certain changes occurred in the F_0 of graft hybrids but that these were not heritable. For instance, the wild potato species *Solanum demissum* and *S. antipoviczii*, which in the writer's experiments normally failed to develop tubers, were induced to form tubers by employing *S. tuberosum* varieties as scions. But the sexual progenies from the stocks reverted to type. Changes were observed in the alkaloid distribution in *Nicotiana glauca*/*N. tabacum*, *N. tabacum*/tomato, *Datura*/tomato and the reciprocal grafts, but these were not transmitted to the sexual progeny of the vegetative hybrids.

3718 Szabó, G. & Vályi-Nagy, T.
Studies on the resistance to streptomycin of *Streptomyces griseus*. II. Interaction among spores.
Acta biol., Budapest 1957 : **8** : 49–60.

S. griseus grown in media containing streptomycin formed large central colonies surrounded by smaller peripheral ones, the spores of the latter showing greater resistance to the antibiotic when reinoculated than those of the latter. The number of colonies formed was not proportional to spore dilution, greater relative numbers being formed at low concentrations. High dilutions of spores or cell-free extracts of spores from the colonies were able to stimulate the growth of spores from the original culture, indicating the production of a substance inducing apparent resistance. This substance proved to be heat-labile.

3719 **Joint discussion with the Systematics Association on "The inheritance of acquired characters".**
Proc. Linn. Soc. Lond. 1958 : **169** : 41–62.

The full texts are given of papers presented at the above discussion [cf. XXVII, 1113].

3720 Smirnov, E. S.
(Inheritance of acquired characters in the process of adaptation).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 464–75. [Russian].

This general review of experiments on inheritance of acquired characters in animals, plants, and microorganisms mentions changes reported by Lysenko in the heritable characters of wheat and by Kosikov in yeast.

3721 Arnoljd, G. [Arnold, H.]
(A very important page in the history of biology).
Agrobiologija (Agrobiology) 1957 : No. 5 : 13–17. [Russian].

Mičurinism and its influence upon biologists in the German Democratic Republic are briefly discussed. I. Segal, B. Rotmaler, O. Schwarz and G. Müller are among those who reject the chromosome theory because it is said to conflict with other biological theories, especially evolution. Rotmaler and Schwarz reject Lysenko's evolutionary views, while others still accept the chromosome theory of inheritance.

3722 Lysenko, T. D.
(For materialism in biology).
Agrobiologija (Agrobiology) 1957 : No. 5 : 4–12. [Russian].

After criticizing neo-Mendelian genetics as unreal and unscientific, the writer extols Mičurinism and discusses the interrelations between external conditions on the one hand and heredity and evolution on the other. Mičurinism is said to have promoted the materialist content in Darwinism. The writer repeats his arguments against the validity of Malthusian laws on overpopulation, and, to establish his thesis that intraspecific competition does not occur, refers to experiments at Gorki Leninskie where forest trees were sown in clusters comprising one species or two different species. These showed that larches and pines developed vigorously in clusters comprising individuals of one species but were suppressed when they shared a cluster with other species such as birch or maple.

3723 Lysenko, T. D.
(For materialism in biology).
Agrobiologija (Agrobiology) 1957 : No. 6 : 3–17. [Russian].

In continuation of an earlier article [3722], it is stated that materialism, which is equated with Mičurinism, asserts the inheritance of acquired characters and that this is the main feature distinguishing it from various idealist and mechanist theories based on formal genetics. In this connexion the *Botaničeskij Žurnal* and other publications edited by V. N. Sukačev are criticized. The claim that a biologist is a Mičurinist cannot be confirmed or rejected merely on the basis of the technique he employs. Mičurinists now use inbreeding, polyploidy and induced mutations.

3724 Michie, D.
Interview with Lysenko.
SCR Sov. Sci. Bull. 1958 : **5** : 1–10.

The subjects discussed included: the heritable effects of grafting, the inheritance of acquired characters in higher plants and microorganisms, shattering of hereditary constitution, and the question whether Mendelian genetics suffered repression in the USSR at the time of the 1948 debate.

3725 Kušner, H. F.
(The problem of inheritance and variability).
Vestn. Akad. Nauk SSSR (Rep. Acad. Sci. USSR) 1958 : No. 1 : 127–29. [Russian].

This report on a recent conference at the Institute of Genetics of the USSR Academy of Sciences refers to addresses upholding Mičurin-Lysenko genetics. Among those who rejected the chromosome theory of inheritance and the concept of genes or DNA acting as units of heredity were N. I. Nuždin, K. S. Suhov, P. V. Makarov and I. E. Glušc̆enko. The plant breeders V. Ja. Jur'ev, T. Ja. Zarubajlo, M. M. Kisljuk and N. D. Muhin and the microbiologists V. D. Timakov, I. Ja. Veselova and N. V. Pokrovskaja cited evidence from their own experiments supporting inheritance of acquired characters. I. M. Poljakov dealt with selective fertilization and G. B. Medvedeva and L. H. Ėjdus with the relation between amount of pollen and the occurrence of paternal characters in the offspring.

3726 Dobzhansky, T.
Lysenko at bay.
J. Hered. 1958 : **49** : 15–17.

Lysenko has recently defended his views in the newspaper *Izvestia.* His arguments are now criticized. Lysenko stated that Mičurinist principles are useful to agriculture in that they allow for the possibility of directed changes in heredity. Classical genetics is supposed to have denied this possibility, whereas in actual fact modern breeding techniques have successfully altered the heredity of living organisms for useful purposes.

Several examples are given of how Lysenko, in order to support his own views and discredit others, quotes remarks out of context and interprets them without regard to the author's meaning. Lysenko has restated at length his views on the nature of heterosis and the problem of species. These are regarded as more typical of the nineteenth or even eighteenth century.

3727 HADDER, J. C. & WILSON, G. B.

Cytological assay of c-mitotic and prophase poison actions.

Chromosoma 1958 : **9** : 91–104.

The standardized *Pisum* test was used to establish criteria for distinguishing c-mitosis and prophase poisoning on a qualitative and quantitative basis, colchicine being chosen as the c-mitotic agent and actidione as the substance causing prophase poisoning [cf. XXIV, 2651]. The following criteria are suggested for c-mitosis. (1) Onset of mitosis is not inhibited. (2) A partial effect consisting of scattered metaphases is followed by the formation of clumps which represent stalled prometaphases and are associated with a full effect. (3) For a given dose under standard conditions, the degree of effect increases steadily with time until either the full effect is shown or an equilibrium is reached. (4) If the times at which several dose curves cross arbitrarily-chosen index values for effect are plotted on a log dose/log time scale, a series of straight parallel lines should be obtained. (5) Polyploid or multinucleate cells or both should be recoverable. The following features are proposed as characteristic of reaction to a prophase poison. (1) Onset of mitosis is inhibited. (2) A specific deviating configuration with the spatial characteristics of late prophase is produced. (3) Measurements based on either inhibition or the deviating configuration indicate a steady increase in effect with time for a given effective dose. (4) If the times at which various dose curves pass through arbitrarily-chosen intercepts for ratio of number of early prophases remainder of division figures are plotted on a log dose/log time scale, a group of straight parallel lines should be obtained. (5) With recovery, configurations in dividing cells are normal in chromosome number and other respects.

3728 FINNEY, D. J.

Plant selection for yield improvement.

Euphytica, Wageningen 1958 : **7** : 83–106.

A mathematical study of selection during a breeding programme is presented with special reference to selection intensity and the number of stages at which selection is applied. It is assumed that a single normally distributed yield characteristic is being selected. Detailed results are available for 1-stage selection and some progress made in dealing with 2-stage selection; more stages of selection present serious mathematical difficulties. It is concluded that the breeder should "allocate equal fractions of the total experimental area to each of the successive stages, and select with equal intensity at each stage, so that in *k*-stage selection each successive stage involves selecting a fraction that is the *k*th root of the overall fraction". Initial discarding is regarded as seldom advantageous and it is doubted whether more than 2–3 stages of selection are economically profitable.

EVOLUTION

3729 STRICKLAND, W. N.

An analysis of interference in *Aspergillus nidulans.*

Proc. roy. Soc. : Ser. B. : 1958 : **149** : No. 934 : 82–101.

"1231 fully classifiable asci of *Aspergillus nidulans* were analyzed for chiasma and chromatid interference. Cross 1 (392 asci) and cross 3 (575 asci) covered the same three intervals in the right arm of the *BI* chromosome, while cross 2 (264 asci) covered six intervals (the same three in the right arm, two in the left arm and the sixth spanning the centromere).

"Chromatid and chiasma interference may be obscured if the analysis is based on data which include double and multiple exchanges within the intervals. The data from the present three crosses include at least double exchanges within the intervals.

"When these double exchanges (revealed by the presence of 4-strand doubles within the intervals) were ignored, no chromatid or chiasma interference was detectable with one exception. One of the crosses gave a suggestion of negative chromatid interference.

"Allowance may be made for undetected double exchanges by the use of Whitehouse's (1956) correction. This correction is based on the occurrence of detected double exchanges within intervals, i.e. 4-strand double exchanges. Since the relation of these 4-strand doubles within intervals to the 2-, 3- and 4-strand doubles between intervals cannot be stated exactly, Whitehouse's (1956) formula must be used with reservations.

"When the undetected double exchanges within intervals are taken into account by Whitehouse's formula, strong negative chromatid interference is detected in two of the crosses but there is still no chromatid interference in the third cross. An attempt has been made to explain these results in terms of a two phase model of exchange.

"The corrected proportions of 2-, 3- and 4-strand doubles between intervals may be used to estimate the numbers of 2-, 3- and 4-strand doubles within the intervals. This gives a corrected distribution of the exchanges within intervals among the tetrads and when this distribution is compared to a Poisson distribution, a very high degree of negative chiasma interference is shown. However, this high degree of negative interference depends on the verity of the corrected proportions of 2-, 3- and 4-strand double exchanges between intervals which are in turn subject to the reservations on the use of Whitehouse's formula".

[Author's summary].

3730 HALDANE, J. B. S.
The cost of natural selection.
J. Genet. 1958 : **55** : 511–24.

A mathematical study of evolution, interpreted as allelic substitution under the influence of natural selection, is presented. The special cases considered are selection in haploid, clonal or self-fertilizing organisms or for matroclinous characters, selection at an autosomal locus in diploids, selection at an autosomal locus with inbreeding, selection of a sex-linked locus in a diploid and heterozygote selection. The number of deaths needed to secure one allelic substitution is independent of selection intensity when this is not extremely strong; it is often ca. 30 times the number of organisms in a generation. The mean time taken for each gene substitution in horotelic evolution is estimated as ca. 300 generations which accords with the observed slowness of evolution.

3731 GEORGE, T. N.
Rates of change in evolution.
Sci. Progr., Lond. 1958 : **46** : 409–28.

In this review of rate and mode of evolution, treated mainly from the paleontological angle, the following topics are discussed: (1) the dangers of treating generic life as an evolutionary unit since different systematists have widely divergent concepts as to what a genus comprises; (2) the lack of correspondence between rapid evolution and diastrophic geological events; (3) mosaic evolution; and (4) the biogenetic law and neoteny.

3732 JARECKO-HMELEVSKIJ, A. A.
(**The origin of the angiosperms according to data on the internal morphology of their vegetative organs**).
Bot. Ž. (Bot. J.) Moskva 1958 : **43** : 365–80. [Russian].

In connexion with an article by G. L. Stebbins [2561] the author states that he finds no grounds for supposing that the angiosperms were polyphyletic in origin and a number of common anatomical features are mentioned which point to their being a homogeneous group. It is pointed out that this conception accords with the experimental evidence of modern genetics, which is in direct contradiction to the views of the neo-Lamarckian and Lysenko schools, most of which are ascribed to faulty techniques or erroneous deduction. Some of the basic tenets of modern genetics are explained for the benefit of the representatives of these schools. The fact that certain characters, such as floral structure and structure of the wood, can vary quite independently is illustrated by the Rosales and Magnoliales. Yet in spite of this the angiosperms have so many common features that a common ancestry must be assumed on statistical grounds. Some of the features they are supposed to have in common with other groups are illusory; for instance the vessels in the Gnetales bear no resemblance to those in the angiosperms in their mode of development. Nor has the wood of the *Casuarina* spp. anything in common with the vessels of the Gnetales or Sphenopsida.

The angiosperms with wood devoid of vessels are considered the most primitive and are thought to have evolved from ancestors of the type of *Sahnioxylon*, which on the basis of their wood characters are thought to be more closely related to the angiosperms than to the Benettitales. The primitive angiosperms are thought to have had vessels with scalariform perforations and to have grown in humid areas; those with simple perforations are considered to be a more advanced type, adapted to less humid habitats. From this line of argument, quite independently of any considerations of floral structure, the Magnoliales would be regarded as the most primitive group of angiosperms.

3733 TIMOFEEV-RESOVSKIJ, N. V.
(**Microevolution. Elementary events. Material and factors of the microevolutionary process**).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 317–36. [Russian].

The basic factor in evolution is defined as the permanent variation in the genotypic composition of any population within a species, arising from gene, chromosome or genome mutations; apart from plastid mutations no other source of variability is known. It is shown how the effects of mutation may be large or small, and differ according to environmental conditions. The random nature of mutations corresponds to Darwin's conception of random variation. Studies of population genetics have demonstrated the occurrence of mutations in natural populations. The fluctuations in the numbers and area occupied by sections of a species afford a means whereby certain mutants may change their proportions in the population, again quite at random, without the operation of selection. The role of various types of isolation in favouring differentiation is examined under the headings of mechanical and biological isolation. The action of selection is enhanced by the pleiotropic effect of many mutant genes and by the fine gradations of their effects in combination with other genes, but the effectiveness of even very low selection pressures operating over extended geological periods is pointed out, and this, combined with isolation, is considered sufficient to explain the origin of species. New species can, it is conceded, arise by hybridization but the importance of this as an evolutionary factor has, it is thought, been exaggerated.

3734 Parsons, P. A.
Evolution of sex in the flowering plants of South Australia.
Nature, Lond. 1958 : **181** : 1673–74.

The distributions of sexual forms among species of the introduced and indigenous floras of S. Australia and the English flora are compared. The analysis provides support for Lewis's hypothesis of the evolution of sexual types [XII, 651].

3735 Leppik, E. E.
Evolutionary relationship between entomophilous plants and anthophilous insects.
Evolution, NY 1957 : **11** : 466–81.

Six stages postulated as having occurred in the evolution of flower types, ranging from the amorphic to zygomorphic, are paralleled with six corresponding stages in the evolution of sensory development among pollinating insects.

3736 Oparin, A. I.
(**The present state of the problem of the origin of life**).
Priroda (Nature), Leningrad 1958 : No. 3 : 11–16. [Russian].

This article gives an outline of the writer's theory of the origin of life and briefly refers to the contributions made at the recent Moscow symposium [1183, 1184 and 3563].

3737 Lao, T.-Y.
(**Methods of studying the ecotypes of plant varieties and their significance**).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin 1958 : **9** : 47–55. [Chinese].

A critical review of Turesson's concept of the ecotype is presented. A sharp distinction between genetic and environmental components of variation is deprecated, following the views of Keller and other Russian authors.

CYTOLOGY

3738 Rangaswami, K.
An improved method of preparing permanent root-tip squashes.
Bot. Notiser 1958 : **111** : 475–76.

An aceto carmine squash method which has proved satisfactory for both root tips and anthers is described. Thin transverse sections of the material are fixed in acetic alcohol, macerated in concentrated HCl for 2 min., transferred to a 1 : 1 mixture of HCl and 95% alcohol for 2–5 min., placed in Carnoy's fluid for 5 min. and finally stained in acetocarmine followed by acetic acid and acetic alcohol.

3739 Navašin, M. S. & Gerasimova-Navašina, E. N.
(**Studying cellular processes in fixed material**).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 167–77. [Russian].

The relative merits of fixed and unfixed material for cytological studies are examined and some of the errors that have crept into Soviet science from the attempt to dispense entirely with fixed material are pointed out to illustrate the amount of information that can be obtained from fixed and stained preparations. Coloured plates are presented showing root meristems of *Allium cepa* at different stages of development and embryo sacs of *Crepis tectorum* before and after fertilization.

3740 Angulo Carpio, M. D.
Acción de agentes físicos en citogenética.
(**Action of physical agents in cytogenetics**).
Genet. iber. 1958 : **10** : No. 1–2 : 99–127.

This bibliography is a supplement to the two published earlier and is similarly arranged [cf. XXVII, 1151].

3741 Balinsky, B. I.
Origin of cells from non-cellular living matter.
S. Afr. J. Sci. 1958 : **54** : 61–66.

The author surveys recent Soviet literature with a view to assessing the status of the views of Lepešinskaja and her collaborators.

3742 Soudek, D.

O vzniku "buněk" koacervací z rozdrcených organismů. **(The origin of "cells" by coacervation of ground organisms).**

Čsl. Biol. 1957 : **6** : 292–96.

Soudek, D.

(The origin of "cells" by coacervation of ground organisms).

Folia biol., Praha 1957 : **3** : 252–56. [Russian].

Coacervates only superficially resembling cells were obtained from proteins in experiments repeating Lepešinskaja's investigations with ground *Hydra* tissues [XXI, 1509].

3743 Woods, P. S.

A chromatographic study of hydrolysis in the Feulgen nucleal reaction.

J. Histochem. Cytochem. 1958 : **6** : p. 103. (Abst.).

Using sections of anthers from flower buds of *Lilium longiflorum*, acid hydrolysates corresponding to different hydrolysis times in the Feulgen procedure were analysed chromatographically for thymine, uracil and adenine content. The analysis suggested that the stain resulting from the Feulgen procedure represents only a part of the DNA actually present.

3744 Heyes, J. K. & Shaw, G. W.

Chemical determination of deoxyribonucleic acid in root tips before and after cold treatment.

Nature, Lond. 1958 : **181** : 1337–38.

Using root tips of *Vicia faba*, *Trillium* and *Paris*, DNA was extracted and precipitated by the method of Schmidt and Thannhauser with slight modifications. Whether based on measurements of phosphorus, deoxyribose or base content, the estimations of DNA content showed a slight increase in the amount per cell after cold treatment (3 days at 0° or 5° C.). Photometric determinations of Feulgen-stain-content indicated, however, a reduction of up to 25% in DNA content of the nuclei after cold treatment. Since the chemical analysis depends upon the estimation of precipitated DNA, and precipitation in turn upon a high degree of polymerization, it is possible that after cold treatment the proportion of smaller units, such as polynucleotides, is reduced, this reduction not being detectable by such analysis. As a second possibility it is suggested that cold treatment causes loss of Feulgen-positive material from the nucleus into the cytoplasm. The fact that the nuclei are able to regain their original DNA content 24 hours after the material has been returned to room temperature demands, however, that this loss should be reversible.

3745 Wu, S.-H.

(The passage of cell nuclei through the walls of somatic cells).

Chi-wu-hsueh Pao (J. Bot.)/Act. bot. sin. 1958 : **7** : 1–14. [Chinese].

Further to an earlier report on nuclear migration in epidermal cells of *Allium* [XXVII, 3695], the author describes the passage of nuclei through parenchymatous cells and vascular tissue in *Allium*. In cereals, nuclear migration appears to accompany the disorganization of the nucellus and antipodal cells. It is thought that nuclear migration may be a method of translocating nuclear material from senescent to young cells.

3746 Serra, J. A.

Interpretation of nucleolar inclusions.

Nature, Lond. 1958 : **181** : 1544–45.

The possible nature of a thread-like formation within the nucleolus, designated the nucleolonema, is discussed with reference to the results of different staining techniques applied to plant and animal material. The author concludes that the nucleolonema is within the same category as vacuoles and other nucleolar components and is not a permanent structure.

3747 Taylor, J. H.

The duplication of chromosomes.

Sci. Amer. 1958 : **198** : No. 6 : 37–42.

In the first part of this paper, evidence obtained by the author and his colleagues in favour of the template theory of chromosome duplication from experiments involving tritium-labelled thymidine is recapitulated [cf. XXVII, 2508 and XVIII, 1403]. The second part elaborates theories of chromosome structure in which DNA molecules are attached as branches to one or two spines of protein. Possibly the spines consist of protein blocks joined by flexible bonds involving Ca atoms.

3748 La Cour, L. F. & Chayen, J.

A cyclic staining behaviour of the chromosomes during mitosis and meiosis.

Exp. Cell Res. 1958 : **14** : 462–68.

La Cour, L. F., Chayen, J. & Gahan, P. S.

Evidence for lipid material in chromosomes.

Ibid. 1958 : **14** : 469–85.

The euchromatic regions of root tip chromosomes of several species after fixation in

Lewitsky's fluid and treatment with a mixture of orange G and aniline blue stained yellow from mid prophase to the end of anaphase but blue at telophase, interphase and early prophase; heterochromatic regions always stained yellow except in early prophase. Staining cycles were also described for chromosomes of pollen grains during mitosis and for the chromosomes of developing pollen mother cells. Nucleoli stained yellow. Evidence is presented which indicates that the yellow reaction is associated with a phospholipid.

3749 Himes, M.
Studies on the chemical nature of sticky chromosomes.
Diss. Abstr. 1957 : **17** : Publ. No. 23,075 : p. 2131. (Abst.)

Using various cytochemical techniques, no differences were found in amount of DNA, tyrosine and tryptophane between normal chromosomes in maize and sticky chromosomes whose condition was caused by the gene *st.* No evidence was obtained that the DNA in the genetically-conditioned sticky chromosomes of maize and in sticky chromosomes in root tips of *Allium cepa* treated with ethylene and hot water was depolymerized.

3750 Sharma, A. K. & Bhattacharyya, U. C.
Cytological studies in Begonia—I.
Cellule 1957 : **58** : 305–29.

Interspecific, intraspecific and intraplant variations in chromosome number were observed in seven species. All showed high pollen sterility. It is suggested that speciation in the genus may be the result of the transmission of somatic chromosome differences by means of vegetative propagation.

3751 Wilson, J. Y.
Kinetochore division prior to metaphase I of meiosis.
Genetica 1958 : **29** : 238–42.

Preliminary observations on *Endymion nonscriptus* have provided evidence that the centromere is in the divided condition as early as the diplotene stage. The author has previously reported that the centromere undergoes division prior to prophase of mitosis in this species [XXVII, 1135].

3752 Schwartz, D.
Deoxyribonucleic acid side-chain model of the chromosomes.
Nature, Lond. 1958 : **181** : 1149–50.

The author has proposed a theory of chromosome structure in which protein segments arranged lengthwise along the chromosome axis alternate and are continuous with two stranded DNA branches, closed at their outer ends [XXVI, 821]. In the present note, three reasons, (1) the virtual identity of the action spectrum for chromosome breakage by ultraviolet rays and the nucleic acid absorption curve, (2) the fact that daughter chromosomes are composed of an original and a new unit, and (3) differential polarity in the two strands of the chromosome duplex, are adduced in favour of the structure postulated by the author as against models involving a continuous protein spine and attached branches of DNA.

3753 Amano, S., Dohi, S., Tanaka, H., Uchino, F. & Hanaoka, M.
The structure of the nucleus studied by electron microscopy in ultrathin sections with special reference to the chromonema—an advocation of "subchromonema" and "protochromonema".
Cytologia, Tokyo 1956 : **21** : 241–51.

From a study of electron micrographs of plasma cells, monocytes and lymphocytes of the mouse, the authors postulate three levels of structure in the chromonema. The protochromonema, of diameter 2–3 mμ, may correspond to the nucleoprotein molecule itself. This is wound into a coil of diameter 13 mμ in the relaxed condition, the subchromonema, and this in turn is wound into the chromonema, which has a diameter of 30–35 mμ when relaxed to its greatest extent.

3754 Stich, H. F. & Naylor, J. M.
Variation of desoxyribonucleic acid content of specific chromosome regions.
Exp. Cell Res. 1958 : **14** : 442–54.

Studies of salivary gland chromosomes of *Glyptotendipes* indicated that the DNA content of specific parts of a chromosome may change independently. It is suggested that "DNA molecules which are produced in excess on the chromosome loci diffuse into the cytoplasm transmitting gene information".

3755 Bailey, P. C.
Hydrogen-ion concentration influences upon the rate of mitosis in root tips of *Trillium sessile* L.
Cytologia, Tokyo 1956 : **21** : 292–99.

Using suitable molar concentrations of HCl, it was found that a pH between 4·0 and 5·0 caused a pronounced blocking of metaphase; a tendency to recover was however detected. Stickiness and excessive contraction of the chromosomes at metaphase were observed in root tips treated at pH values of 4·1–5·3. NaOH concentrations of 0·003 M (8·9 pH) and 0·0015 M (8·5 pH) decreased the total percentage of dividing nuclei over a 96-hr. period. A retardation of mitosis at metaphase was evident at a concentration of 0·003 M NaOH.

3756 BAILEY, P. C.
Hydrogen-ion concentration influences upon the rate of mitosis in root tips of *Trillium sessile* L. 2. Comparative study of two buffer systems.
Cytologia, Tokyo 1956 : **21** : 300–05.

Experiments were carried out on the effect of various concentrations of H ions on rate of mitosis when these concentrations were adjusted by two buffer solutions. Solution I, giving a pH of 4·0–8·0, was prepared by using KCl, KH phthalate, KH_2PO_4, H_3BO_3, HCl and NaOH. Solution II, providing the same pH range, was prepared by using citric acid and disodium phosphate. Solution I only brought about a slight block in metaphase at 4·0 and 8·0 pH. Solution II caused a definite block of late prophase and metaphase after treatment for 24 hr. at 4·0–8·0 pH. Exposure to solution I at 4·0 pH resulted in a more contracted condition of the chromosomes at late prophase and metaphase than is normally observed. The effects of solution II included stickiness and clumping of the chromosomes after treatments at the higher pH values.

3757 EVANS, H. J., NEARY, G. J. & TONKINSON, S. M.
Mitotic delay in irradiated roots of *Vicia faba*: the effect of oxygen.
Nature, Lond. 1958 : **181** : p. 1083.

A dose of 192 r. of γ rays applied to roots in water through which nitrogen was bubbled was less effective in delaying the progress of cells through the mitotic cycle than a dose of 109 r. in aerated water. Comparison of the delays induced by both doses, in the aerated water and water + nitrogen, for cells which were more than 6 hr. from metaphase at the time of irradiation, gave an air : nitrogen ratio of about 2.

3758 CARR, A. J. H. & OLIVE, L. S.
Genetics of *Sordaria fimicola*. II. Cytology.
Amer. J. Bot. 1958 : **45** : 142–50.

The cytology of the mycelium, young archicarp and various stages of ascus development are described [XXVI, 2026], and the similarity in chromosome behaviour and morphology between *S. fimicola* and *Neurospora crassa* is discussed with reference to possible cytotaxonomic research on fungi.

3759 LETTRE, H.
Die Dissoziabilität einzelner Mitoseschritte. (**The dissociability of the various phases of mitosis**).
Scientia, Bologna 1956 : **91** : 127–31.

The individual phases of mitosis are temporally coordinated. Instances are mentioned where this coordination has been disturbed by chemical factors; for example division of the cytoplasm may be unaccompanied by nuclear division or the reverse, multipolar mitoses may occur or individual chromosomes be separated from the rest of the set. On biochemical grounds it is assumed that during cell division respiration of the cell ceases owing to inactivation of the mitochondria; reactivation of the mitochondria before cell division is completed may cause the division to be suppressed. Most of the cytological abnormalities mentioned are discussed with reference to animal cells and in particular the production of tumours.

3760 MORRISON, J. H. & WILSON, G. B.
Influence of L-ascorbic acid on the colchicine reaction.
Science 1958 : **127** : 1389–90.

Using the standardized Bowen-Wilson *Pisum* test and the index of colchicine activity devised by Hadder and Wilson [3727], it was found that ascorbic acid behaved as an inhibitor or enhancer of the effect of colchicine upon mitosis, according to the pH of the mixture, the molarity ratio and the integrity of the ascorbic-acid molecule.

3761 EVANS, W. L.
The effect of cold treatment on the desoxyribonucleic acid (DNA) content in cells of selected plants and animals.
Cytologia, Tokyo 1956 : **21** : 417–32.

Exposure to 3° C. did not suppress division of root-tip cells of *Trillium erectum* and *T. sessile*, both species showing a decrease in the amount of DNA in the nuclei at prophase and metaphase, as indicated by microscopic observations and by spectrophotometric measurements. The slight increase found in the DNA content of somatic nuclei of *Tradescantia edwardsiana* is attributed to the suppression of mitosis in this species by low temperature. In the grasshopper *Chortophaga viridifasciata*, no significant changes were detected in the amounts of DNA during the meiotic cycle as the result of cold treatment. The data suggested the occurrence of at least two types of DNA in *Trillium*: a stable type associated with euchromatic regions and a more labile type in heterochromatic regions. The decrease in DNA content appeared to be due to a deficiency of the labile fraction. It is pointed out that the effect of cold treatment in *Trillium* is markedly similar to changes induced in chromosomes by other physical and chemical agents, such as 5-aminouracil and an ultraviolet microbeam. Reduction in the amount of DNA by cold treatment occurs, it is concluded, only in plants with large heterochromatic regions and with the ability to continue mitosis at low temperature. It is therefore suggested that the observed reduction in DNA content does not invalidate the general concept of DNA constancy as advocated by Swift and others.

3762 Evans, H. J., Neary, G. J. & Tonkinson, S. M.

The use of colchicine as an indicator of mitotic rate in broad bean root meristems.

J. Genet. 1957 : **55** : 487–502.

Cultural conditions are described under which the primary roots of *Vicia faba* seedlings show a constant rate of growth and mitotic index (number of cells in mitosis expressed as a percentage of the total number of cells scored) for a limited period. By removing the plumules, the diurnal fluctuation in root growth and mitotic index was eliminated. Experiments with colchicine, acenaphthene, p-dichlorobenzene, α-bromonaphthalene and 8-hydroxyquinoline indicated that colchicine was the only spindle inhibitor causing marked increases in metaphase counts. Three concentrations of colchicine, 0·1, 0·05 and 0·025%, were similar in capacity for inducing metaphase accumulation in treatments for 1–6 hr. The depression in rate of metaphase accumulation resulting from treatments lasting more than 6 hr. is attributed to an inhibitory effect of the colchicine which slows down the rate of entry of cells into mitosis, the time spent in interphase thus being increased. The time required for colchicine to disrupt metaphase spindles which were organized prior to the commencement of treatment was directly dependent on the concentration. For this reason the rate of metaphase accumulation over the first hour of treatment cannot be used to determine the mitotic rate. The mean number of metaphases accumulated in a population of 1000 meristematic cells over a period of 1–6 hr. was 30·1 ± 1·3 cells per hr. Allowing for the escape of 2 ± 1 cells per hr. from c-metaphase into interphase, the number of cells entering metaphase per hr. was thus estimated as 32·1 ± 1·6. The rate of entry of cells into metaphase was used to determine the time parameters of the mitotic cycle. The method of calculation and formulae for the kinetics of growth of the cell population are given. When using the colchicine technique, the mean mitotic time and total mitotic-cycle time were found to be 3·9 ± 0·2 and 24·6 ± 1·5 hr. respectively. These values are in close agreement with those obtained by other investigators by different methods.

3763 Rees, H.

Differential behaviour of chromosomes in *Scilla*.

Chromosoma 1958 : **9** : 185–92.

In a diploid clone of *S. sibirica* with highly irregular meiosis, the chromosomes within a single PMC displayed abnormal differences in degree of condensation from diplotene to metaphase, two or three classes of chromosomes being distinguishable. The long chromosomes were more often retarded than the short. No evidence was obtained of a direct causal relationship between condensation and chiasma formation. Up to six or more nucleoli were observed, in contrast to the normal number of one or two for the species. The nucleoli were associated with both advanced and retarded chromosomes. As suggested by observations on fragments and their parent chromosomes, the spatial relations of the chromosomal material may be one of the factors affecting synchronization.

3764 Taylor, J. H.

Incorporation of phosphorus-32 into nucleic acids and proteins during microgametogenesis of Tulbaghia.

Amer. J. Bot. 1958 : **45** : 123–31.

Examination of autoradiographs prepared from sections of anthers of *T. violacea* fixed in FAA (18 parts 70% alcohol: 1 part glacial acetic acid: 1 part formalin) showed that DNA synthesis occurs in premeiotic interphase, in very early interphase of the microspore and in the generative nucleus at late interphase. In the tapetal nuclei DNA was synthesized at two stages during pollen-grain meiosis, in each case prior to a mitotic division. RNA synthesis ceased or fell to a very low level in both nucleus and cytoplasm during zygotene pairing, the late stages of meiosis when the chromosomes were condensed and during periods of DNA synthesis.

3765 Stern, H.

Variations in sulfhydryl concentration during microsporocyte meiosis in the anthers of *Lilium* and *Trillium*.

J. biophys. biochem. Cyt. 1958 : **4** : 157–61.

"Anthers of lily and trillium were followed with respect to variations in protein and soluble sulfhydryls during meiosis and mitosis of the sporogenous tissue. In lily, the meiotic and mitotic cycles are each preceded by a rise in soluble —SH; in trillium there is only one rise which precedes meiosis. During division there is a marked drop in soluble —SH and a rise in soluble disulfides. Protein —SH remains approximately constant until diakinesis or metaphase when it falls briefly."

[Author's summary].

3766 THODAY, J. M.
Inaccuracies of anaphase estimation of radiation-induced chromosome exchange.
Nature, Lond. 1958 : **181** : p. 932.

Wolff and Luippold [XXVII, 1150 and 2529] have drawn attention to the qualitatively different dose-response curves obtained by scoring metaphase aberrations and anaphase bridges, and to other discrepancies which are in conflict with the classical theory of chromosome breakage. The present writer makes the following suggestion. "In classical theory, exchanges are produced in numbers proportional to the square of the X-ray dose. Breaks are produced in numbers proportional to dose. At a given dose, D, the probability of an exchange in any one chromosome arm will be αD^2 and the probability of a chromosome break in any chromosome arm will be βD. The probability of an exchange and a break involving the same chromosome arm will be $\alpha D^2 \times 2\beta D$, the factor 2 being introduced because the exchange involves two arms. Now half these coincident breaks will be between the exchange point and one of the centromeres and may effectively prevent an anaphase bridge occurring. The expected number of anaphase bridges will be proportional to $\alpha D^2 - \alpha BD^3$." It is considered unlikely that the suggested correction will allow for the discrepancy reported by the above authors, unless the effective breaks adhered at metaphase and separated at anaphase. The correction would however reconcile discrepancies between metaphase and anaphase data on chromatid exchanges, some departure from the $(\text{dose})^2$ law being required in the case of exchange at high doses.

3767 DAVIDSON, D.
The irradiation of dividing cells: changes in sensitivity to X-rays during mitosis.
Ann. Bot., Lond. 1958 : **22** : 183–95.

The results of investigations on *Vicia faba*, already briefly reported, are described in full [XXVII, 1157].

3768 MALATESTA, P. & COTTONE, S.
Mutazioni cromosomiche e mitoinibizioni da alogeno acetamidi in *Allium Cepa*. (**Chromosomal mutations and mitoinhibition induced by halogen acetamides in *A. Cepa***).
Ric. sci. 1957 : **27** : 100–08.

The above compounds depress the growth of wheat seedlings and one of the most active substances, iodoacetamide, was used in a cytological study involving root tips of *A. cepa*. It was found to be a mitoinhibitory substance; some aberrant mitotic figures and chromosome bridges and fragments were also observed.

3769 OCKEY, C. H.
A quantitative comparison between the cytotoxic effects produced by proflavine, acetylethyleneimine and triethylene melamine on root-tips of *Vicia faba*.
J. Genet. 1957 : **55** : 525–50.

Treatment was limited to 1 hr., with a recovery period of 24 hr. The following effects were scored: chromosome breakage, inhibition of mitosis, stickiness at anaphase, effects on the spindle and lethal effects in dividing and non-dividing cells. The action of proflavine was characterized by preprophase inhibition, prophase poisoning, pronounced stickiness and breakage. The last effect was induced mainly at anaphase and is ascribed to the mechanical strain on the sticky chromosomes during this and other stages of mitosis. Acetylethyleneimine (AEI) and triethylene melamine (TEM) caused preprophase inhibition and breakage. Both agents probably induced breakage during early interphase. AEI was effective over a range in concentration down to 1/1000 ml., whereas TEM had the same qualitative effects down to 1/100,000 ml. Breakage was more marked in the case of treatment with TEM than with AEI. A comparison was also made between the effects of freshly-prepared TEM (new) and deteriorated TEM (old). With both samples, the effects were observed for the same range in concentration. TEM (new) induced a higher frequency of breaks, however, than TEM (old). Chromosome aberrations caused by TEM and AEI at metaphase have been analysed for a wide range of concentrations. Both agents produced similar aberrations, but the frequency per cell examined was higher with TEM than with AEI. In the case of both substances, the frequency of aberrations increased up to a certain concentration, above which a decrease was observed. The reduction in frequency was related to the inhibition of mitosis at the higher concentrations. If the aberrations are expressed as aberrations per cell affected, chromatid breaks (B′) and translocations (Tr) decreased in frequency, while chromosome breaks (B″) and sister reunions (SR) increased with rise in concentration of TEM (old) and AEI. With TEM (new), the frequency of translocations remained constant whereas the frequencies of the other aberrations, B′, B″ and SR, increased with the concentration. In all cases the ratio SR/Tr became higher the greater the concentration. These results are explained more satisfactorily in terms of the chromatid-exchange hypothesis advanced by Revell [XXIV, 1624] than by the generally accepted interpretation of chromosome breakage. It is further suggested that variation may occur in the degree of contact between the chromosomes during interphase; this assumption would explain the increase in the ratio SR/Tr with concentration. The frequency of the sister-reunion type of chromatid exchange is considerably greater with TEM (new) (maximum of 2·36 per cell examined) than with TEM (old) (maximum of 0·65) or AEI (maximum 0·28). It is suggested that severe damage to the chromosomes, brought about by SR aberration, may be the basis of the tumour-inhibiting effect of these agents.

3770 SHARMA, A. K. & BHATTACHARYYA, N. K.
Chromosome breakage through para-dichlorobenzene treatment.
Cytologia, Tokyo 1956 : **21** : 353–60.

Previous investigations indicated the value of p-dichlorobenzene as a prefixative promoting the clarification of chromosome morphology [XXV, 1588]. Experiments on 6 dicotyledons and 10 monocotyledons have shown that, if the duration of treatment is prolonged considerably beyond the time required for clarifying, caryotype breakage may be induced. The species tested included *Lens esculenta*, *Vicia sativa*, *Lathyrus sativus*, *Pisum sativum*, *Cicer arietinum* and *Allium cepa*. The species differed with respect to the period of treatment required for breakage. In general, dicotyledons required longer periods than monocotyledons. When the frequency of breakage was not very high, the fragments persisted for several cell generations, the potentiality of the chemical as a mutagen thus being indicated.

3771 SHARMA, A. K. & BHATTACHARYYA, N. K.
A study on spontaneous chromosome fragmentation in *Vicia sativa* Linn.
Cytologia, Tokyo 1956 : **21** : 361–75.

A full account is given of investigations already briefly reported [cf. 260].

3772 CELARIER, R. P. & MEHRA, K. L.
Determination of polyploidy from herbarium specimens.
Rhodora 1958 : **60** : 89–97.

Using both living and herbarium specimens, size of pollen grains and size of stomatal guard cells were found to be fairly reliable as indicators of degree of polyploidy within *Dichanthium annulatum*, *Bothriochloa ischaemum*, *B. intermedia* and *B. pertusa*. An impression technique using plastic strips is described for examining guard cells in herbarium specimens. Various recommendations are offered concerning procedures in assessing degree of polyploidy by the above two criteria in herbarium material.

3773 KIMURA, K.
(**Nuclear behaviour accompanying diploidization in the Hymenomycetes. II. The case of doubly compatible combinations**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 26–31. [Japanese].

Nuclear migration from small diploid mycelia of the tetrapolar fungus *Coprinus macrorhizus* var. *microsporus* to large haploid mycelia, compatible in respect of both compatibility loci with each of the nuclei of the diploid mycelium, was studied. Rate of nuclear migration and conjugation appeared to depend on modifiers. Sometimes both nuclei from the diploid arrived simultaneously at a terminal cell of the haploid mycelium. When this occurred, conjugation sometimes took place between the two intrusive nuclei instead of between one of these and the nucleus already present.

3774 KIMURA, K.
(**Nuclear behaviour accompanying diploidisation in the Hymenomycetes. III. The case of compatible combinations**).
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 65–70. [Japanese].

Using the same species as above [3773], diploid mycelia were inoculated into haploid mycelia, one of the nuclei of the diploid mycelium being compatible with respect to both compatibility loci with one of the diploid nuclei but the other diploid nucleus being compatible with respect to one locus only. In some cases, the incompatible diploid nucleus arrived first and then conjugated with the other diploid nucleus when it arrived.

3775 POWELL, E. O.
An outline of the pattern of bacterial generation times.
J. gen. Microbiol. 1958 : **18** : 382–417.

Data are provided on the generation time of samples of *Aerobacter cloacae*, *Serratia marcescens*, *Streptococcus faecalis* and *Pseudomonas aeruginosa* under various sets of conditions as determined by microscopic observation of individual cells. A general mathematical analysis of the results is given and it is concluded that there is a positive association between the generation times of organisms closely related by descent. Generation time appears to be determined partly by heredity and partly by chance molecular events.

3776 BRUN, J.
Caryocinèses aberrantes répétées conduisant à la stérilité mâle par l'action d'un facteur mendélien. (**Repeated aberrant caryocineses leading to male sterility caused by the action of a Mendelian factor**).
Experientia 1958 : **14** : p. 186.

Male sterility in an albino form of *Epilobium spicatum* is thought to be determined by a recessive factor. In the pollen mother cells, abnormal caryocineses occurred repeatedly after meiosis; the chromosomes were distributed without any previous pairing or doubling.

3777 KRAAI, A.
Bijen en hommels bij het veredelingswerk. (**Bees and bumble bees in breeding work**).
Meded. Dir. Tuinb. 1958 : **21** : 291–97.

For pollination of one or a few plants in isolation cages, honey bees in miniature hives, bumble bees or parasitic bumble bees have been found useful at the Wageningen Plant Breeding Institute, Netherlands. Among bumble bees, queens infected with *Sphaerularia bombi* or males are more effective pollinators in captivity than healthy queens or workers.

3778 VENDRELY, C.
Le rôle biologique de l'ADN. (**The biological role of DNA**).
Arch. Klaus-Stift. VererbForsch. 1957 : **32** : 561–69.

Studies indicating that DNA is a constituent of genes and influences hereditary characters are reviewed and mention is briefly made of the possible structure of DNA and its ability to initiate the formation of a specific protein.

3779 BERG, R. L.
(**Further investigations on stabilizing selection in the evolution of the flower**).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 12–28. [Russian].

In continuation of previous studies [XXVII, 2545], the author points to the intimate interrelation between the shape of the flower in many species and their insect visitors, which relationship could only have developed, it is argued, if the flower as a whole, rather than its individual parts had evolved. Measurements on 17 further species showed a lower degree of variation in the dimensions of the floral organs than in the vegetative organs, the variation being least in species with bilateral symmetry and tubular corolla, adapted to insect pollination, and somewhat greater in self-pollinating species such as *Triticum aestivum*, wind-pollinated species such as *Elymus arenarius*, or other species with radial symmetry such as *Fragaria collina*. The species adapted to insect pollination also showed the least correlation between dimensions of floral and vegetative organs, i.e. their flowers had the greatest degree of autonomy, except in the case of certain ornamental species such as tobacco, where the role of natural selection has been suppressed. The tubular parts of the corolla showed greater autonomy than the radial portions.

A state of autonomy such as that described is most likely to arise when the processes of form development, in this case residing in the plant, and those of selection, residing in the insect pollinator, do not coincide.

3780 SCHWEMMLE, J.
Über Kreuzungen mit verschiedenen Formen der *Oenothera odorata* bei Früh- und Spätbestäubung. I. (**Crosses with different forms of *Oe. odorata* by early and late pollination. I.**)
Planta 1958 : **51** : 223–48.

Oe. odorata mother plants of genetic composition v.I were crossed with pollen of both v and I types. The v.I mother plants induced forms with both plastids and cytoplasm of either the *odorata* or *berteriana* type and others had *berteriana* cytoplasm combined with *odorata* plastids. In all cases more seed was set in crosses with older ovules than with young ovules. The two pollen types differed in their reaction to chemotropically active substances produced by the ovules; composition of cytoplasm and plastids influenced affinity between the pollen and ovule types.

3781 SCHWEMMLE, J.
Über Kreuzungen mit verschiedenen Formen der *Oenothera odorata* bei Früh- und Spätbestäubung. II. (**On crosses with different forms of *Oe. odorata* with early and later pollination. II.**)
Planta 1958 : **51** : 249–87.

Interspecific crosses were carried out with the above species, which is of the genetic constitution v.I; three forms of *Oe. odorata* with differing combinations of cytoplasm and plastids were used as the female parents (cf. 3780). The affinity of different pollen types for the two ovule types depended on the genetic constitutions of the gametes, the type of cytoplasm and plastid in the ovule, and the age of the ovule at the time of fertilization. Pollen from *Oe. scabra* (*hsc*), *Oe. campylocalyx* (*ck*) and a heterozygote carrying the *B* complex was best in fertilizing young ovules; for pollen of *Oe. argentinea* (*ha*) the best time for pollination varied with the different types of plastid and cytoplasm in the ovules.

3782 Kellenberger, E.
Ce que l'étude des bactéries et des bactériophages apporte à la génétique. (**What the study of bacteria and bacteriophages contributes to genetics**).
Arch. Klaus-Stift. VererbForsch. 1957 : **32** : 412–26.

Studies on transduction, bacterial conjugation and transformation are reviewed in order to show how this work is throwing light on bacterial genetics and in particular on the role played by DNA.

CROP PLANTS

3783 Geidel, H. & Wermke, M.
Zur Auswertung von Feldversuchen mit Hilfe von Lochkartenmaschinen. (**On the analysis of field trials with the help of punched-card machines**).
Z. Pflanzenz. 1958 : **39** : 225–38.

The employment of punched-card procedures in agriculture is considered, reference being made to literature dealing with the usual methods. Presentation and storage of data are briefly described; calculations from the data may be effected by either a conventional punched-card machine or an electronic computer. An example is given in which the results of a single experiment are subjected to variance analysis.

3784 Gaul, H.
Entstehung von pflanzlichen Mutationen durch Bestrahlung. (**Producing plant mutations by means of irradiation**).
Landw. Forsch. 1958 : 11. Sonderheft : 110–16.

Progress made in inducing plant mutation by irradiation is surveyed with special reference to the value of this technique for plant breeding.

3785 Woodward, V. W.
Radiation benefits and hazards.
What's New Crops Soils 1958 : **10** : No. **7** : 18–19.

This popular article deals with mutation induced by irradiation; a brief mention is made of the use of irradiation techniques in plant breeding.

Report of the Scottish Plant Breeding Station 1958 : Pp. 81.

3786 *Director's report.* (*pp. 5–30*).

Oats. Investigations on the resistance of oat varieties to *Ditylenchus dipscaci* were continued [cf. 3790].

Herbage plants. In order to find a grass tolerant of a wide range of environments, studies are being carried out with strains of the same maturity type from different environments, which are geographically separated; the present experiments involve seven early strains of perennial rye grass and ten late strains of cocksfoot. Progenies from new combinations of parents of an erect type of late ryegrass [cf. XXVII, 3765] had some valuable characteristics. Mediterranean populations of cocksfoot, ryegrass and *Festuca arundinacea* were observed in the field and crosses were made between some promising types of cocksfoot. Current genecological studies are mainly concerned with hill vegetation. Trials of *Agrostis* species from different ecological habitats and geographical areas showed that variation within habitats is considerable but significant differences also occur between habitat populations and these differences may be maintained for a second year. *A. tenuis* shows this tendency more than *A. canina*; some differences in rate and habit of growth between these species are noted. Crossing was found to take place readily between these two species in the greenhouse and it is thought that, whichever species is the female parent, the hybrids resemble *A. tenuis* rather than *A. canina*. It was confirmed that reduplication of genotypes can be a serious source of error in genecological studies and it easily occurs undetected [cf. 3789]. It is suggested that "since the source of the trouble is the use of the within-population variance as an error item, more reliable data of genecological interest could be collected if the trials were designed with an alternative error in mind. One such item is that variance derived as 'between means of populations from ecologically similar sites' ". A small-scale study of the genotypic constitution of *Taraxacum* in local populations was commenced.

As regards lead tolerance in *F. ovina*, the plants studied fell into three groups with high, medium and low tolerance; each population consisted of almost entirely one type. It is thought probable that a major gene system is responsible for variation in tolerance. Hybridization studies indicated that tolerance is dominant to intolerance.

Potato. Testing commercial varieties and new progenies for resistance to *Phytophthora infestans* continued. Some immune or highly resistant progenies were retained for further testing and breeding. Promising selections raised in previous years were either intercrossed or back crossed. *Solanum demissum*, *S. stoloniferum* and *S. simplicifolium* were used as sources of resistance.

S. demissum has shown some resistance to "aggressive" eelworm populations. The cross *S. vernei* x *S. demissum* is expected to give tetraploid seedlings capable of being crossed with commercial varieties. Other wild species have also shown resistance.

Twenty-six varieties were infected with the Arran Victory strain of virus S and none showed clear symptoms; varieties reacted differently to the paracrinkle strain and some of the varieties were apparently without symptoms. Amongst a collection of South American potatoes, some types were found tolerant of viruses X or Y. Apta, Virginia and Dr. McIntosh were less susceptible to virus Y than Craigs Snow White but more susceptible than either Arran Banner or 1591(b)9. Earlier indication of clonal variation in Majestic as regards susceptibility to virus Y and leaf roll was not substantiated. An allelomorphic series of three major genes was found to determine immune, necrotic and tolerant reactions to virus X in *S. acaule*; the reactions were independent of the strain of virus. In *S. tuberosum* a single gene was proved to control immunity to virus X; it was not possible to decide, from the data available, whether this gene is a dominant allelomorph of *Nx* or *Nb* or independent of them with epistatic effect. The virus strain X^D was shown to cause a nonlethal foliar necrosis in the presence of *Nb* and plants that are duplex for *Nb* react far more intensely; severe necrosis does not occur in the absence of *Nx* and *Nb*. A single gene in *S. demissum* controls a necrotic reaction to virus Y accompanied by a similar response to virus A; this gene is dominant over another gene responsible for a necrotic reaction to virus A only, the two genes being alleles. Clone CPC5lb of *S. chacoense* has gene-controlled hypersensitivity to virus Y. Breeding for combined resistance to viruses X and Y and serological work on the differentiation of strains of potato virus X continued.

Sugar beet. Some Cambridge lines showed satisfactory resistance to bolting in trials held at Musselburgh and some of the Pentlandfield lines gave good results. Three lines bred at Logie Farm, Newburgh, gave high yield and showed some resistance to bolting but the tops were of less than average weight. Some recent crosses combine good-sized roots with a high yield of foliage.

Brassica. Observations were made on giant and dwarf rapes and selections were made of the plants which held their leaves longest in the winter. The hybridizations included giant rape x hungry-gap kale and from the cross Bruce turnip x hybrid kohl rabi x thousand-headed kale, which had received colchicine treatment, seeds were obtained by bud selfing and from pollination by hungry-gap kale. Studies on *B. oleracea* are in progress with a view to determining suitable criteria for judging leafy brassicas. Some progress was made in the development of marrow-stem kales which combine heavy foliage with a short stem. Details are provided of the stem and leaf production of progenies arising from a cross between thousand-headed kale and Royal Oak broccoli. The hybrids had shorter stems than a commercial control variety of thousand-headed kale but a back cross to an unrelated plant of thousand-headed kale had long stems weighing as much as those of the control; this back cross and one of the hybrid lines had significantly more foliage than the control. F_1 plants from crosses between thousand-headed kale and sprouting broccoli were large with long stems, weak side-shoot development and a high yield of unattractive leaves; there was no autumn flowering. F_1 generations of spring cabbage x thousand-headed kale had loose hearts of cabbage-like leaves and tended to flower in autumn.

3787 *Sinskaya [Sinskaja], E. N. Investigations on the composition of ecotypical and varietal populations. (pp. 31–40).*

Reference is made to the author's law of zonal population variability [cf. XXVI, p. 516] as follows: "The course of the successive variability in the population compositions in the process of zonal ecotype (and species) formation is expressed by the system of spiral intergrading series in which some variants are gradually eliminated, and others gradually change in environmental conditions. At the same time analogous variants (ecoelements) in neighbouring (zonal or vertical) series are not wholly identical and express successive stages of natural selection". This law is said to be followed by the distribution of biotypes in some *Onobrychis* populations occurring in vertical belts in the northern Caucasus.

Also reviewed here are studies of varietal populations of winter wheat and rye; under conditions of unusually late spring sowing, three main groups of biotypes were found, differing according to their time of ear emergence. Gorskij made sowings of winter wheat, barley and rye in both valleys and hill regions in the north-western Caucasus and found that in the valleys, from July to December, it is impossible to distinguish biotypes differing in the length of time required for vernalization. The temperature during this period is said to act as a stabilizing factor with regard to times of ear emergence. This period was however suitable for selecting biotypes of differing stem height. Investigations with timothy ecotypes indicated that the effect of vernalization depends on environmental conditions and on the nature of the ecotype. The course of panicle emergence of a polar ecotype was influenced by vernalization in the north at Puškin but there was no effect in the south at Majkop. A north Caucasian ecotype was not affected by vernalization at either place. Varieties of sunflower were produced by allowing interpollination between plants chosen for their desirable characters. When such varieties were transferred from Krasnodar to Siberia, they sometimes showed prolonged periods of flowering and varied considerably in height. Several types of varietal populations were distinguished; for example, one type of population consisted of only long-day biotypes and another population consisted of later long-day plants and comparatively early short-day plants. Under the short-day conditions in Siberia, these different types may be distinguished but at Krasnodar the population is stabilized. The higher temperature during spring and summer accelerates the development of most biotypes of sunflower and results in their flowering times coming closer together so that interpollination is easier and is effected by a diverse mixture of pollen. Such pollination is considered to be "the most favourable for reproducing the whole varietal population as an entity at the highest level of its vitality".

Experiments are mentioned in which sudden changes of a factor had a greater effect, as regards segregating biotypes, than the constant action of the same factor. Short-day treatment of sunflower throughout the plants' life was not so effective in segregating short-day from long-day biotypes as short-day treatment applied only 25–30 days after the appearance of the seedlings. The capacity of a given treatment to disintegrate a population into different biotypes depends on the stage of development. A population of *Perilla ocymoides* growing from the seedling stage under short-day conditions for 15–20 days and then transferred to natural or 24-hour day conditions disintegrated into several markedly different types. The variability in some respects exceeded the known range for this species.

The author concludes by emphasizing that it is possible to find effective methods for either stabilizing or disintegrating a given population. [Cf. 1218].

3788 *Clausen, J. & Hiesey, W. M. Phenotypic expression of genotypes in contrasting environments.* (*pp. 41–51*).

By reference to examples from the literature, it is shown that many plants possess a considerable amount of usually unexpressed variability. This variability may become evident if the plant is moved to a markedly different environment or if ecotypes from different environments are crossed; under these conditions, latent genes may be activated.

3789 *Harberd, D. J. Progress and prospects in genecology.* (*pp. 52–60*).

It is shown, by reference to studies with *Festuca ovina*, that techniques of population sampling may be responsible for apparent differences between local populations. Repetition of genotypes in the sampling reduces the standard error and makes it appear that population differences exist whereas in fact they do not. Genotype reduplication in sampling could be a considerable source of error when dealing with perennial species capable of vegetative spread. Other investigations of 13 species from 80 stands of a bent fescue community indicated that there had been no genecological differentiation between the sites for any of the species. It is pointed out that if any two adjoining populations had been compared, regardless of the others, differences might have been assumed to be ecotypic. Since there was no genecological differentiation, selection in this case was not powerful enough to overcome gene flow. It is thought unlikely that selection occurs against characters of moderate disadvantage.

At Pentlandfield plants of natural grasslands have been studied in particular and the conclusions tentatively drawn from this work include the following: (1) Frequently there is no intraspecific differentiation within a region and the local form is sufficiently adaptable to occupy a variety of habits without change in genetical composition; (2) where differentiation occurs within a region, the total number of distinguishable races is small; and (3) material gathered from places which are geographically widely separated is more likely to be differentiated than material from within a small region. These conclusions suggest that isolation rather than selection is the main source of differentiation.

3790 *Cameron, D. & Speed, D. W. Resistance in oats to attack by the stem eelworm* Ditylenchus dipsaci *(Kühn). (pp. 66–74).*

Oat seedlings of susceptible varieties and of varieties reputed to be resistant were injected with suspensions of *D. dipsaci*; the same varieties were also grown in a field infested with eelworm. It was found that those varieties which were least affected by the field and inoculation tests had the lowest number of eelworms in the tissues, as indicated by the number of eelworms per inch of leaf sheath at maturity. Early Miller and varieties derived from it were considered to be tolerant, since their growth is not greatly retarded after injection with a large number of eelworms. Early Miller is also able to inhibit the rapid multiplication of eelworms in its tissues; Milford has this capacity to a greater extent. *Avena ludoviciana* was both inhibitory and tolerant of eelworm; a hybrid between *A. ludoviciana* and Milford was more resistant than Milford. Further studies are being carried out to determine whether the resistance of *A. ludoviciana* may be transferred to cultivated varieties and whether the two types of resistance can be combined in a hybrid between Early Miller and Milford. The genetic nature of the various types of resistance is also being investigated.

Twenty-sixth Annual Report of the Minister for Agriculture, Dublin, 1956–57 : Pp. 173 + 82.

3791 *Special technical and advisory work. Seed propagation division. (pp. 66–70).*

Wheat. Crosses were made at the Cereal Station, Ballinacurra, between varieties such as Atle, Atson and Peko to combine quality and high yield in spring wheat. Atle x Progress progenies were selected. A derivative of Redman x Hybrid 27 was used as a stem-rust resistant parent. Selections from progenies of neutron-treated material were propagated for testing.

Barley. Testing of strains from Spratt-Archer x Kenia continued. Selections were made from more recent crosses between Herta, Ymer, Carlsberg and other varieties. Further work was carried out on progenies derived from seed treated with X rays and neutrons and on crosses of XC-11 with commercial varieties. XC-11, a selection from X-irradiated material, has been used as a parent to combine some of its "unusual grain characteristics" with high yield and other desirable properties.

Potato. Hybridization continued at Dungorman, Co. Donegal.

3792 *Report of the Agricultural Department, University College, Dublin, for the year 1956–57. (pp. [1]–[17]).*

Wheat. Since a race of yellow rust has appeared which is capable of attacking the winter wheat Glasnevin Rosa [cf. XXVII, 2574], breeding is in progress to develop varieties with improved resistance. Promising selections have been secured from various crosses, particularly from Glasnevin Rosa x Minister.

In spring-wheat breeding, increasing attention is being given to milling and baking quality. Derivatives of Glasnevin Rosa x Kärn [Kernel] and other crosses are under investigation.

Oats. Promising selections have been obtained from crosses of Glasnevin Triumph with Blenda, Bonstar and Abed Minor.

Barley. Breeding included crossing of Maythorpe with Carlsberg, Piroline and Kenia-Maja.

Brussels sprouts. Varieties have been developed for the fresh market. One strain suitable for freezing purposes is being increased by the National Institute of Agricultural Botany, England.

Tomato. The hybrid Victory x Radio has given high yields and been distributed on a limited scale for commercial trial. Selections of possible value in breeding were made for resistance to *Cladosporium* leaf mould.

Forty-eighth Annual Report of the John Innes Horticultural Institution, Bayfordbury, Hertfordshire 1957 : Pp. 46.

3793 *Williams, W. Department of Plant Breeding. (pp. 6–13).*

Induced mutation.

The rate of mutation affecting flower colour was determined in *Digitalis purpurea*, a solution of radioactive sodium dihydrogen phosphate being injected into the hollow cortex of the flowering spike at doses ranging from 100 to 400 μC. per plant. The maximal activity per g. dry weight thus obtained in the floral parts was 0·5 μC. From the number of recessive white-flowered mutants, it was estimated that the frequency of gametic mutation was 6·7%. The frequency of the mutants was 0·37% among seedlings germinating first and 1·30% among seedlings germinating later; this result points to the selective effect that may occur if sampling is restricted to any one part of a population. Compared with normal purple-flowered plants and natural white-flowered mutants, the induced mutants showed a reduction in germination rate and plant height.

Apple. Observations on the occurrence of mildew (*Podosphaera leucotricha*) on 3400 seedlings derived from crosses between 31 varieties were completed. Resistance is quantitatively inherited. Within a given variety the relative mean scores for the resistance of selfed and crossed families closely corresponded; the degree of resistance to be expected from crosses may therefore be estimated if the performance of the selfed progeny is known. Of the cultivated varieties, Beauty of Bath and Lord Lambourne made the highest and Merton Russet and Late Orange the least contribution to their progenies with respect to resistance. Kola, James Grieve, Dabinett and Annie Elizabeth also imparted a high average resistance. The resistance of Kola, a hybrid between *Malus ioensis* and Duchess of Oldenburg, is believed to have originated from the former parent.

A pale-green lethal condition affecting seedlings behaves as a simple recessive. At least 35% of the cultivated varieties in the collection at the institute are heterozygous for the lethal, the occurrence of which shows no relationship with the geographical origin of the varieties.

Pear. Study of microsporogenesis and embryology in Beurré Bedford has been completed [cf. XXVII, 3770]. Meiosis is normal except that wall formation fails to occur at the end of division II. The young pollen grains each have four nuclei lying separately in the cytoplasm immediately after meiosis. Later, they usually become arranged close together towards one side of the cell, the four nuclei undergoing mitosis simultaneously. Fusion of the metaphase plates occurred in 81·4% of the pollen grains, anaphase separation resulting in the formation of 4*x* generative and vegetative nuclei. When the four nuclei are sufficiently apart, each divides on a separate spindle to give two daughter nuclei. The arrangement of the nuclei in the individual pollen grains is determined by polarity within the cytoplasm, this polarity being in turn the expression of a polarity affecting the entire anther.

Cherry. A dwarf type of *Prunus avium* due to a single recessive gene has been discovered. The mutant is characterized by diminished size of all plant parts, including internode length. It flowers normally but the leaves are crinkled and tend to become chlorotic in midseason. Over a 10-year period the mutant has not differed significantly from normal sister seedlings in longevity or susceptibility to disease. The possibility of using the type as a dwarfing rootstock is being explored.

Rubus. Investigations on the role of the ♂ parent in apomixis continued. *R. laciniatus* (4*x*), when selfed, gave seedlings low in vigour compared with seedlings obtained when the same plants were pollinated by *R. procerus* (4*x*) or *R. magnificus* (6*x*). In general, seedling vigour has been found to increase with chromosome number of the ♂ parent [cf. *loc. cit.*].

Study of variation in wild raspberries revealed that these possess very few characteristics likely to be useful in breeding. Apart from variation in fruit colour, hairiness and anthocyanin development, the populations failed to exhibit marked differences over a wide geographical area.

Strawberry. Progress has been made in securing promising ever-bearing segregates from crosses between everbearers and summer-fruiting varieties.

The relationships between 2*x* species of *Fragaria* are being investigated. Of the 40 crosses attempted, 24 have proved successful. Variation in interspecific compatibility is shown by disparities in seed set, viability and seedling survival. Ten of the crosses have so far only succeeded in one direction. These mainly involve *F. vesca* and *F. nipponica*. The former is fully fertile when used as ♀ but rarely successful as ♂; *F. nipponica* shows the reverse behaviour.

Tomato. In the programme for developing F_1 hybrids, progress was made in back crossing to incorporate marker genes for the purpose of authentication, a gene for long protruding style in order to obviate the need for emasculation, and genes for resistance to *Cladosporium fulvum*. None of the F_1 hybrids tested showed sufficient improvements in early and total yields and in fruit shape to merit release for commercial production.

Interactions with respect to flower number were detected between the "lateral suppressor" mutation *ls* [cf. *loc. cit.*] and other recessive markers.

3794 *Lewis, D. Department of Genetics. (pp. 14–20).*

Unilateral incompatibility between species.

The unilateral incompatibility previously found between a self-compatible species as ♀ and self-incompatible species as ♂ in the gametophytic system [XXVI, 3062], also occurs in the sporophytic system of the Cruciferae. In the Onagraceae, self-compatible species with the balanced lethal system of ring-forming chromosomes do not show unilateral incompatibility. From previous studies it is known that self-compatible species without this unilateral incompatibility have recently become self compatible through mutation. With reference to the incompatibility system, a theory of the origin of balanced lethals in *Oenothera* spp. has been developed. Although they have been self pollinating for a long period, these species retain important features of the self-incompatibility system.

Quantitative characters.

The tomato Ailsa Craig, *Lycopersicon pimpinellifolium* and their reciprocal F_1s were grown under glasshouse and field conditions, measurements being made of leaf length, height to first truss, number of flowers in the first truss and number of days to flowering. The results confirmed those of an earlier analysis of the relationship between dominance, phenotypic stability and environment [XXIV, 775]. Data from *Antirrhinum* hybrids emphasized that the influence of the maternal genotype should not be overlooked in interpreting the relationship between dominance and phenotypic stability.

Seedling selection.

A study of seedling selection as a breeding method has been completed [cf. 3771]. Data on the progeny of radishes selected for cotyledon size showed that selection for large cotyledons may offer a means of increasing root yield.

Other investigations.

Work was also carried out on the breeding system in *Nolana* spp., the biochemical genetics of the anthocyanins in *Primula sinensis*, and the genetics and cytology of *Coprinus lagopus*.

3795 *Dodds, K. S. Department of Potato Genetics. (pp. 21–25).*

Late blight.

Selfed progenies of *Solanum tuberosum* ssp. *andigenum* were surveyed for field resistance on the partially correlated basis of rate of growth of the pathogen in detached leaves. The identities of 11 races were checked on differential hosts. The races were then used to distinguish *R* genes in some 600 seedlings produced in the breeding programme. Preliminary observations were made on the relation between foliage and tuber resistance in varieties carrying *R* genes.

Viruses.

Seedlings were selected for resistance to virus Y by mechanical inoculation with a mild strain and back testing apparently healthy plants on tobacco or a line of *S. demissum* giving the reaction of local lesions. Lines of *S. demissum* exhibiting a range of response were intercrossed with a view to investigating the inheritance of reaction to this virus. In some lines of ssp. *andigenum*, a high proportion of the seedlings reacted to virus X with local lesions and remained free from systemic infection.

Interspecific hybridization.

Hybrids have been secured from *S. verrucosum* ($2n = 24$) x *S. tuquerrense* ($2n = 48$), *S. colombianum* ($2n = 48$) x *S. tuquerrense*, *S. stoloniferum* ($2n = 48$) x *S. tuquerrense*, *S. moscopanum* ($2n = 72$) x *S. tuquerrense* and *S. moscopanum* x *S. spectabile* ($2n = 72$). Meiotic observations suggested that all these species differ in chromosomal structure.

The crossability of Mexican and South-American diploid tuber-bearing species was investigated. The Mexican species *S. cardiophyllum*, *S. ehrenbergii*, *S. jamesii*, *S. pinnatisectum* and *S. verrucosum* were crossed with the South American species *S. kurtzianum*, *S. phureja*, *S. simplicifolium*, *S. soukupii*, *S. stenotomum* and *S. vernei* in all possible directions. With the exception of *S. verrucosum*, these are self-incompatible species. A few seeds were obtained from a small number of combinations involving the self-incompatible species, notably between *S. simplicifolium*, *S. ehrenbergii* and *S. pinnatisectum*, but it is not yet known whether they are hybrid. *S. verrucosum* failed as a ♂ parent in crosses with South-American self-incompatible species but set berries when used as ♀ parent. Nearly all crosses between South American species gave berries with abundant seed. In contrast, many of the crosses between Mexican species failed, e.g. *S. ehrenbergii* and *S. cardiophyllum* were crossable but neither could be crossed successfully with any other Mexican species. Crosses of *S. verrucosum* with Mexican self-incompatible species failed in both directions. No differences were detected between pollen of Mexican and South-American species in rate of growth down the styles of *S. verrucosum*.

Anthocyanins.

The action of the three main genes for pigmentation in the tuberous species has been elucidated. *P* controls production of 3′,4′,5′-trihydroxylated pigments, viz. acylated delphinidin and petunidin 3-rhamnoglucosido-5-glucoside and myricetin-3-glycoside. *R* is responsible for the presence of cyanidin-3-rhamnoglucoside and acylated peonidin 3-rhamnoglucosido-5-glucoside in the tuber, while *Ac* determines not only the acylation of the five anthocyanidins with one molecule of *p*-coumaric acid but also the attachment of a glucose residue in the 5-position and methylation of some cyanidin to peonidin and of some delphinidin to petunidin. The general bearing of these results on the biogenesis of flavonoid pigments in higher plants is considered.

3796 *Department of Plant Cell Biology.* (*pp. 26–34*).

Chromosome breakage.

It has been reported that chiasma-like structures occur at anaphase I in *Lilium longiflorum*, when irradiation is given at the preceding metaphase. This observation did not agree with the general one that, if breakage takes place at metaphase I, whole chromatids are broken and the resultant aberrations may be observed at anaphase II. In a study of the effects of X irradiation on meiosis in *Tradescantia bracteata*, no chiasma-like structures have been seen at anaphase I after treatment at metaphase I. Chromatid breakage occurred but could not be detected until anaphase II. Chiasma-like structures were observed at anaphase II when the preceding interphase had been irradiated. Prometaphase I was the stage most sensitive to X-ray treatment.

DNA.

Homogenization experiments on onion and bean roots confirmed cytochemical data by showing that DNA in interphase root-meristem cells is mainly localized in the cytoplasm. Using a photometric method and roots of *Vicia faba* it has been found that the amount of Feulgen stain in the nucleus may differ according to the temperature at which the plants were raised. Comparison of the intensity of Feulgen stain in nuclei of a diploid hyacinth with that in nuclei of a trisomic for a nucleolar chromosome, in plants grown at 10° or 30° C., revealed no variation in DNA content as the result of the influence of the nucleoli.

Heterochromatic segments in metaphase chromosomes which have been subjected to low temperature stain only weakly with Feulgen, apparently owing to loss of DNA. It is possible that the DNA becomes more acid-labile than normal and consequently is removed by acid hydrolysis during the Feulgen schedule. By using the double stain methyl-green pyronin on sections of cold-treated root tips of *Trillium grandiflorum*, no evidence was however obtained in support of this possibility.

A solution of tritiated thymidine was applied to the roots of seedlings of *Vicia faba*. It was of particular interest to find that nuclei in the differentiated zone had intense autoradiograph activity, in view of the conclusion reached by Howard and Pelc, using P^{32}, that no DNA synthesis occurred in the nuclei of this zone [cf. XXIII, 2268].

The possible value of injecting radioactive material into the rhizome of *Trillium* spp. as a technique is being explored. The method appears to offer possibilities because autoradiographs of root-tip cells have indicated that labelled adenine is present in interphase nuclei about 6 hr. after injection.

3797 *Descriptions of Merton fruits.* (*pp. 41–42*).

Notes are given on the origin and characteristics of (1) Merton Worcester (Cox's Orange Pippin x Worcester Pearmain), an apple which has been in commerce for a number of years, (2) the apple Merton Beauty (Cox's Orange Pippin x Ellison's Orange) [cf. XXVII, 4348], and (3) the cherry Merton Glory (Ursula Rivers x Noble) [cf. XXII, 2530].

3798 **Thirty-Eighth Report and Accounts of the National Institute of Agricultural Botany, Cambridge.** 1957 : Pp. 56.

The report includes the main results of variety trials of cereals, forage legumes, potato, sugar beet, vegetables and other crops at the Cambridge headquarters and subsidiary centres in England, Wales and Scotland.

3799 **Report of the Fourth Crop Conference held at the Cambridge Union Society on 12th and 13th December, 1956.** J. nat. Inst. agric. Bot. 1957 : **8** : 181–249.

At the above conference, held under the auspices of the National Institute of Agricultural Botany, England, to discuss practical aspects of crop production, a session was devoted to each of the topics of (1) the seed testing service, (2) vegetable crops and (3) wheats. Session (2) included the contributions Research on vegetables by J. Philp, who dealt with breeding and other means of improvement, and Choice of variety in vegetables by C. G. Finch. Papers in the third session comprised: Choice of wheat varieties for spring and autumn, E. G. Thompson; Wheat varieties and diseases, C. C. V. Batts; and The farmer's choice of cereal varieties, J. A. McMillan.

3800 BELL, G. D. H.
Some aspects of plant breeding.
J.R. agric. Soc. 1957 : **118** : 91–101.

The concepts and techniques upon which modern crop breeding is based are outlined for the benefit of the nonspecialist, and illustrated by a discussion of wheat, barley and sugar-beet breeding at the Plant Breeding Institute, Cambridge, and elsewhere in England.

3801 HOWARD, H. W.
Crops and plant breeding.
J.R. agric. Soc. 1957 : **118** : 119–30.

With reference to recently published papers, a review is given of work on genetics, breeding, variety testing and other aspects of producing cereals, sugar beet, kale, potatoes, grasses and leguminous crops in Great Britain.

3802 **Guide to varieties of field and vegetable crops under trial, observation and propagation.**
Nat. Inst. agric. Bot. 1958 : Pp. 71.

This booklet gives information on the variety trials, observation plots and other experiments being carried out on field and vegetable crops at the Cambridge headquarters of the institute and subsidiary stations in England, Wales and Scotland. Part 5 lists the pedigrees and places of origin of the cereal varieties under trial or multiplication.

HOFFMANN, W.
Bericht der Landwirtschaftlichen Fakultät. (**Report of the Faculty of Agriculture**).
Wiss. Z. Martin-Luther-Univ. Halle-Wittenberg 1957 : **6** : 481–528.

The following reports contain matter connected with plant breeding.

3803 *Stubbe, H. Institut für Genetik. (Genetics Institute). (pp. 484–86).*

In an outline of the activities of the institute it is mentioned that studies on *Antirrhinum* have shown the existence of individual alleles that affect heterosis, which cannot therefore be regarded as the cumulative effect of dominant genes influencing yield.

Certain mutants possessing a positive selection value have been isolated. Some of the tomato mutants excel the original variety in such characters as earliness, the barley mutants in standing capacity, smooth awns, earliness and naked grain [cf. 1653] and the soya-bean mutants in size of bean, number of pods per plant, earliness and capacity to germinate at lower temperatures [cf. XXVII, 3582].

No evidence was obtained of any hereditary influence of stock on scion in grafts of *Antirrhinum*, tomato or potato and Russian claims of conversion of winter into spring cereals have not been confirmed.

3804 *Hoffman, W. Institut für Pflanzenzüchtung. (Plant Breeding Institute). (pp. 493–96).*

Details are given concerning the reorganization of the plant breeding institute, which has been transferred from Halle to Hohenthurm, 10 km. to the north, and of the present breeding programme. Three improved varieties have been released, viz. Saale malting barley, Hohenthurmer Gleichzeitigreifender [Hohenthurm Uniform-ripening] hemp and Askania winter barley.

Bericht über die Arbeitstagung 1956 der "Arbeitsgemeinschaft der Saatzuchtleiter" im Rahmen der "Vereinigung österreichischer Saatgutzüchter" (**Report on the 1956 meeting of the working party of the principal seed producers within the framework of the Association of Austrian Seed Producers**).
Gumpenstein 1956 : Pp. 211. (Mimeographed).

3805 *Brouwer, W. Betrachtungen über die Beziehungen zwischen Pflanzenzucht, Pflanzenschutz, Pflanzenernährung und Pflanzenbau. (Reflections on the relationships between plant breeding, protection, nutrition and cultivation. (pp. 3–16).*

Ways in which the quality and yield of crops may be improved by breeding and the application of suitable cultural treatments are surveyed. The interaction of heredity and environment in determining the performance of a crop is emphasized.

3806 *Hänsel, H., Fenzl, E. & Czeika, G. Genetische und chromosomale Labilität von Linien und Sorten. (Genetic and chromosomal instability of lines and varieties). (pp. 17–48).*

During 1955 an exceptionally high frequency of plants with chlorophyll defects was found in a barley field at the Probstdorf Breeding Station. The highest frequency occurred in untreated plants of the variety Vollkorn [Round Grain]; X_5 lines of the same variety and more heterozygous material had lower frequencies. In two successive years, certain X_3 lines of Vollkorn grown under greenhouse conditions gave 3 : 1 ratios for green and albino progeny respectively;

similar seed grown in the open gave the same result in one year but in another year there was a marked deficit in albino seedlings; the albino seedlings may have died at a very early stage under unfavourable conditions. It was also noticed that some seedlings which appeared white in the early stages of development later became normal green plants or *virescens* types and some *virescens* types gave only normal green progeny. It is concluded that chlorophyll defects in barley are not always the result of mutation but may be modifications of the normal type. Root-tip preparations of 10 lines of *Triticum aestivum* 'Stamm 101' [Race 101], with $2n = 42$, were studied; the number of mitoses involving less than 42 chromosomes was between 10 and 20% for eight of the lines; the two remaining lines and two other varieties of *T. aestivum* had percentages of about 2–3%. A detailed study of one of the lines of Stamm 101 revealed the existence of 14 chromosome pairs in both meiosis and mitosis, thus indicating the loss of a genome. A positive correlation was found between the frequency of reduced chromosome numbers in meioses and mitoses in root tips of the same plant, the percentage being twice as great for the mitoses as for the meioses. It appeared that the differing frequencies of chromosome reduction amongst the various lines of Stamm 101 were genetically determined. Some discussion is presented of the significance of chromosome instability for plant breeding.

3807 *Schober, K. Saatgutumsatz und Sortenwandel bei Getreide in Niederösterreich. (The sale of seed and change of variety amongst cereals in Lower Austria). (pp. 49–61).*

A brief mention is made of some characters that are required in new varieties of common cereals suitable for North Austria.

3808. *Lein, A. Qualitätsfragen der Weizenzüchtung in Deutschland. (Questions of quality for wheat breeding in Germany). (pp. 79–93).*

After surveying the ways in which the gluten content and quality of wheat are evaluated in Austria and Germany, the author mentions some spring-wheat trials which indicated that these two characters are largely hereditary and negatively correlated with each other.

3809 *Rudorf, W. Wildarten und Primitivformen unserer Kulturpflanzen als Genreserven! (Wild species and primitive forms of our cultivated plants as gene reserves). (pp. 94–212).*

A survey is presented of progress made at the Max Planck Institute in breeding disease-resistant forms of wheat, barley, potato, fruits and vegetables, by introducing genes from related wild forms into cultivated varieties.

3810 *Lokscha, H. Über die Strahlungsenergie und ihre Anwendung in der Pflanzenzüchtung. (The energy of radiation and its application in plant breeding). (pp. 122–29).*

A brief outline is presented of the uses of irradiation and radioactive isotopes in studies connected with plant breeding; Austrian institutes which are concerned with such work are mentioned.

3811 *Scheibe, A. Untersuchungen über Genge-steuerte Formbildungsprozesse bei der Erbse. (Investigations on gene-controlled morphogenetic processes in the pea). (pp. 130–43).*

The substance of this paper has been summarized from another source [cf. XXVII, 4618].

3812 *Bock, H. Die Polyploidisierung von Zuckerrüben. (Polyploidization of sugar beet). (pp. 144–63).*

Practical methods used in breeding polyploid sugar beet are surveyed, reference being made to the experiences of some Austrian breeders; the agronomic properties characteristic of polyploids are also mentioned.

3813 *Gedanken uber die Verwendung natürlicher Verhältnisse in der Selektion. (Thoughts on the use of natural conditions in selection). (pp. 164–65).*

It is thought that too much use is made of laboratories and glasshouses in plant breeding and that, if more selection were carried out under extreme environmental conditions, better plants would be obtained.

3814 *Wünsche des praktischen Züchters an die Versuchsmathematiker. (What the practical breeder desires from the experimental mathematician). (pp. 165–66).*

A plea is put forward for simple methods of (1) determining whether or not a trial may be statistically evaluated; (2) analysing the grouping of the treatments and (3) preventing errors entering the final results.

3815 *Schreiber, F. Aktuelle Fragen der Bohnenzüchtung. (Current questions of bean breeding). (pp. 167–69).*

Desirable characters for bean varieties are listed; a brief mention is made of recent attempts to incorporate resistance to the delta race of

Colletotrichum lindemuthianum in the variety Imuna.

3816 *Jähnl, G. Statistik des Versuchswesens.* (*Statistics of experimental design*). (*pp. 170–94*).
The meaning of various statistical terms is explained and brief descriptions are provided of procedures in common use for the analysis of variance.

3817 *Fuchs, H. Qualitätsfragen vom müllerischen und bäckerischen Standpunkt.* (*Questions of quality from the milling and baking standpoint*). (*pp. 195–211*).
A critical survey is presented of the ways in which the milling and baking qualities of wheat varieties are estimated in Austria.

3818 Holienka, J.
Organisace a náplň výzkumné činnosti Výzkumného ústavu rostlinné výroby v Ruzyni. **(The organization and nature of scientific research at the Institute of Plant Industry at Ruzyně).**
Věd. Práce výzk. Ústav. rostlin. Výrob. 1957 : **3** : 9–21.
Mention is made of new varieties of economic plants bred at the above institute and its branches, including the following. The spring wheat Plná Sláma [Solid Straw] does not lodge and outyields the standard varieties by 15–32%. New hybrids of maize include high yielding single and double crosses, also spontaneous hybrids which arose from some Italian material which exceed Stupická Raná [Stupice Early] in earliness. Heterotic hybrids of poppy have been bred. The best among them, Hanácký x Dětenický Bělosemenný [Detenice White-seeded] outyields Azur by 23%. Several heterotic hybrids of spinach are also listed.

3819 Barbacki, S.
Uwagi o osiągnięciach w dziedzinie uprawy i hodowli roślin w okresie dziesięciolecia. **(Remarks on achievements in plant breeding and cultivation during a period of ten years).**
Postępy Nauk Roln. 1954 : No. 6 : 12–19.
A review of the Polish literature of the last ten years is given. The following crops are considered: wheat, rye, potato, sugar beet, lupin, vetch, serradella, soya bean, lucerne, maize, oil crops, flax, hemp and hops. Acclimatization and breeding of certain wild plants are also discussed.

3820 Somos, A.
(The development of Hungarian-Soviet contacts in the realm of agricultural science).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 11 : 143–46. [Russian].
Mention is made of distant wheat-*Agropyron* hybrids obtained in Hungary by Cicin's methods, also of a highly productive *Setaria viridis* variety and an *Orobanche*-resistant sunflower, both derived from material introduced from the USSR.

Huitième Congrès International de Botanique, Paris 1954. Comptes Rendus des Séances et Rapports et Communications déposés lors du congrès dans les sections 3, 4, 5, 6, 7, 8, 9, 10, 11 et 12. **(Eighth International Botanical Congress, Paris 1954. Accounts of meetings and reports and communications presented to the Congress in sections 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12).** Pp. 266; 277; 192; 239.
The following subjects are dealt with: section 3, botanical terminology; section 4, taxonomy; section 5, paleobotany; section 6, palynology; section 7, phytogeography; section 8, morphology and anatomy; section 9, cytology; section 10, genetics and experimental taxonomy; and section 11, physiology.

Sections 3, 4, 5, *and* 6.

3821 *Régnier, R. Distribution géographique et origine des* Populus. (*Geographical distribution and origin of* Populus). (*pp. 184–86*).
Notes are provided on the geographical distribution of the six subgroups comprising the genus and on the paleontological evidence concerning their evolution. The *Turanga* group is considered to be the most primitive.

Sections 7 *and* 8.

3822 *Blakeslee, A. F. & Avery, A. G. Bud sports in Datura found due to chromosome and not to gene mutations.* (*p. 268*).
"Bud sport are not uncommon in *Datura*. All so far analysed have been due to chromosome changes; none to gene mutations. Doubling of chromosome number, either spontaneous or induced by colchicine treatment, may occur independently in any of the 3 germ layers and give rise to periclinal chimeras and morphologically abnormal branches. Single chromosomes may be eliminated from either $2n$ or $2n + 1$ plants to give rise to $2n - 1$ or $2n$

branches. The 1–2 chromosome and especially the 1 half of this chromosome are most frequently eliminated. The secondary $2n + 1 - 1$ type has the $1 - 1$ chromosome so frequently eliminated resulting in $2n$ branches that it is difficult to retain the type by grafting".

Sections 9 *and* 10.

3823 *Marquardt, H. & Grundmann, E. Der Gehalt an DNS von normalen und röntgenbestrahlten Interphasekernen bei* Vicia faba. (*The content in DNA of normal and X irradiated interphase nuclei of* V. faba). (*pp. 11–14*).

DNA synthesis was found to proceed regularly during interphase until a certain value was reached when mitosis began. At the same time, the size of the nucleus increased but not at the same rate as DNA synthesis; both rates varied during interphase. Irradiation with X rays prevented mitosis, inhibited the formation of DNA and led to the development of pycnotic nuclei. Interphase could be subdivided into stages differing and with respect to nuclear size and DNA synthesis; inhibition of the latter by X rays took place at two of these stages.

3824 *Mikaelsen, K. Protective property of certain chemicals against radiation induced chromosome aberrations.* (*pp. 17–20*).

Glutathione, cysteine, thiourea, sodium cyanide and sodium hyposulphite each had a protective effect upon chromosome fragmentation, when added to the nutrient solution in which cuttings of *Tradescantia paludosa* were kept during γ radiation.

3825 *Butler, J. A. V. The genetical implications of the Watson-Crick model of deoxyribonucleic acid.* (*pp. 21–23*).

In Watson and Crick's model of DNA, the bases are arranged in pairs and this has suggested a possible means of reproducing the nucleotide chain with the bases in any specific order. Some of the difficulties encountered in accepting this as a model for gene reproduction are mentioned. It is considered that biological activity is carried by a larger pattern than that in the individual nucleotide thread; a configuration of several parallel threads united by basic proteins in the nucleoprotein complex is a possibility. Also discussed is the possible way in which the nucleotide pattern of DNA may ensure accurate pairing of chromosomes; certain pairs of bases can combine with themselves, whilst others are not able to do this. If DNA particles correspond to genes, then the particles must be arranged in a linear order and this would be possible through the protamines or histones in the nucleoprotein complex. According to the Watson and Crick model, when reduplication of the DNA particle takes place, one half of the duplicate is made of newly synthesized material and the other half of the original material. New histone links would have to be made and this may be the stage when crossing over occurs.

3826 *D'Amato, F. Données et perspectives des recherches sur les actions antimitotiques et mutagènes.* (*Data and views of research on antimitotic and mutagenic action*). (*pp. 24–32*).

In opening the discussion, questions are presented which arose from consideration of other papers read at the congress. The questions included criteria for classifying mitotic poisons, the physiology of mitosis and the mode of action of mitotic poisons, the mutagenic action of physical and chemical agents and the causes of spontaneous mutation.

3827 *Favarger, C. Sur le pourcentage des polyploïds dans la flore de l'étage nival des Alpes Suisses.* (*On the percentage of polyploides in the flora of the snow level of the Swiss Alps*). (*pp. 51–56*).

The author's studies showed that a relatively low percentage of polyploid plants is to be found in high alpine regions, the percentage being much lower than that of southern Greenland or Spitzbergen.

3828 *Favarger, C. Sur une origine possible de l'esparcette cultivée* Onobrychis viciifolia *Scop.* (*On a possible origin of cultivated* O. viciifolia *Scop.*) (*pp. 56–62*).

O. arenaria from a district in Valais was studied cytologically and compared with *O. viciifolia*; the former had $n = 14$ and the latter $n = 28$. Similarities in the genomes of the two forms suggested that *O. viciifolia* had originated from *O. arenaria* but the satellite chromosome pair in one of the genomes in *O. viciifolia* was larger than that in the corresponding pair of *O. arenaria*. This was taken to indicate that *O. viciifolia* is either a segmental allopolyploid, a segmental interchange having taken place, or an intervarietal allopolyploid.

3829 *Esser, K. Genetische Analyse eines neuen Incompatibilitätstypes bei dem Ascomyceten* Podospora anserina. (*Genetical analysis of a new type of incompatibility in the ascomycete* P. anserina). (*pp. 72–78*).

Reports of this work have been summarized elsewhere [cf. XXV, 2790, 2791 and 2792].

3830 *Linder, R. Le taux de compatibilité. Son utilisation dans l'étude des relations entre style et pollen chez les polyploïdes.* (*Percentage compatibility. Its utilization in the study of relations between style and pollen in polyploids*). (*pp. 78–80*).

Self incompatibility in *Oenothera missouriensis* was shown to be conditioned by a series of at least four opposing multiple allelomorphs [cf. XXIII, 1673]. In order to determine whether compatibility depended on a difference of one or two *S* alleles between style and pollen in tetraploid *Oenothera*, the percentage of successful pollinations to be expected in each case was calculated. The percentages found in populations of the experimental tetraploid *Oe. missouriensis* and natural tetraploid *Oe. fruticosa* showed that, in each case, a difference of one allele was sufficient for compatibility.

3831 *Lewis, D. Incompatibility, a summing up.* (*pp. 81–85*).

With reference to papers on incompatibility presented at the congress, an outline is given of the present state of knowledge on this subject.

3832 *Gagnieu, A. Interaction noyau-cytoplasme dans la réalisation d'un type de stérilité mâle chez le lin cultivé.* (*Nucleo-cytoplasmic interaction in the determination of a type of male sterility in cultivated linseed*). (*pp. 103–05*).

Male sterility was noticed amongst some linseed plants of unknown origin; the sterility was found to be associated with certain phenotypic characters. The aberrant plants were designated *b* types and resembled male-sterile plants which other workers had observed in progeny from a cross between procumbent and tall types. However, observations made on crosses between procumbent and tall plants of various stocks revealed that male sterility was not determined by a single factor associated with growth habit. Crosses were also made between *b* type sterile plants and ordinary varieties. In some of the progeny from a cross with the variety Kostroma as pollen parent, the *b* type characters were accentuated. Other varieties suppressed the expression of *b* characters. It was not possible to introduce male sterility into stocks where it had never arisen spontaneously. From all these results it was concluded that type *b* male sterility depends upon the interaction of certain nuclear and cytoplasmic factors.

3833 *Heilbronn, A. Plasmon und Geschlecht.* (*Plasmon and sex*). (*pp. 105–08*).

Sex determination in *Bryonia* [cf. XIX, 2382] is discussed with reference to a hypothesis involving cytoplasmic inheritance.

3834 *Ephrussi, B., Margerie-Hottinguer, H. de & Roman, H. Sur le comportement génétique des mutants à déficience respiratoire de la levure.* (*On the genetical behaviour of yeast mutants deficient in respiratory activity*). (*pp. 111–20*).

[Cf. XXVI, 2040 and XXVII, 1481].

3835 *Rizet, G. & Marcou, D. Longévité et sénescence chez l'ascomycete* Podospora anserina. (*Longevity and senescence in the ascomycete* P. anserina). (*pp. 121–28*).

A later report of this work has now been summarized [cf. XXVII, 3659].

3836 *Stubbe, W. On the analysis of the plastidome of* Oenothera. (*pp. 129–30*).

Green plastids in *Oenothera* are known to mutate spontaneously into yellow or white ones and to preserve their mutant character in combination with all genomes. In order to investigate plastidome-dependent characters, attempts were made to combine the plastids of all species with genomes of all the haploid complexes in Renner's collection; in these crosses, one of the parents always possessed mutated white or yellow plastids to act as a tracer. It is stated that the complex-heterozygosity of *Oenothora* produces constant hybrids; the gametes possess the original Renner complexes of the parents unchanged and the parental genome combination may be reconstructed by a single backcross. All the plastid types are to be compared when in combination with one definite genome and the nature of the plastidomes is to be studied.

3837 *Pal, B. P. The problem of wheat breeding in India.* (*pp. 131–36*).

In this brief survey of wheat breeding in India, mention is made of past achievements and present-day breeding for disease resistance, hardiness and improved quality; physiological studies are also under way.

3838 *Larroque, P. Les complexes héréditaires. Leur détermination et leur utilisation pratique.* (*Hereditary complexes. Their determination and practical utilization*). (*pp. 136–39*).

Each systematic unit is said to be characterized by a particular combination of phenotypic characters which fluctuate within precise limits, this combination being the "hereditary complex". The characters are associated with each other in a definite order and statistical determinations of correlations between characters are possible. Precise knowledge of hereditary complexes would make it possible to standardize taxonomic units and would aid in directing evolution. If the conditions were known under which a certain combination of characters appeared, the chances of reproducing this combination would be increased. By selecting individuals with a hereditary complex including desired characters, it would be possible to make precise selections of suitable breeding lines; much of the crossing, selfing and comparing of lines and progenies, necessary with the usual breeding methods, would no longer be required.

3839 *Srb, A. M. Mutations in yeast produced by treatment with beta-propiolactone.* (*pp. 140–43*).

It was found that when canavanine-sensitive cells of haploid yeast are treated with 0·002% β-propiolactone for 20 hours and plated on to media containing canavanine, the frequency of resistant colonies is much higher than that found when untreated cells of the same culture are similarly plated. Methods used to eliminate experimental pitfalls in this type of study are mentioned.

3840 *Fincham, J. R. S. Effect of gene mutation on enzyme formation in* Neurospora. (*pp. 144–47*).

An example is described where a gene mutation seems to prevent the production of a single enzyme [cf. XXV, 94]. Other cases where the relationship is not so simple are mentioned. There is a mutant which requires arginine and fails to grow on citrulline [cf. XXVI, 949]; some indications of arginine synthesis were however found in extracts of this mutant and it is possible that the gene mutation caused a qualitative or quantitative alteration in a specific enzyme but not the complete loss of a specific enzyme.

3841 *Bryssine, P. La variation phénotypique du génotype chez les légumineuses en fonction de la dimension de semences.* (*Phenotypic variation of the genotype amongst leguminous plants as a function of the size of the seeds*). (*pp. 147–49*).

Quantitative characters of plants are said to be correlated with seed size but no detailed information is provided.

3842 *Glavinitch* [*Glavinić*], *R. Comparaison de l'hybridation végétative et sexuelle des plantes.* (*A comparison of vegetative and sexual hybridization of plants*). (*pp. 149–50*).

[Cf. XXVII, 942].

3843 *Glavinitch* [*Glavinić*], *R. Hybrides du cotonnier obtenus de plusieurs pères.* (*Cotton hybrids obtained from several male parents*). (*pp. 151–53*).

Gossypium barbadense 'Maarad' was pollinated with a mixture of pollen from *G. hirsutum* '78' and *G. herbaceum* 'Asiatique' [Asiatic]; hybrids are described which had the characters of both male parents.

3844 *Mathon, C. C. & Stroun, M. Remarques sur l'hybridation végétative des céréales. Transport d'embryons sur albumens étrangers.* (*Remarks on vegetative hybridization of cereals. Transfer of embryos on to foreign endosperms*). (*pp. 153–59*).

[Cf. XXVI, 2200].

3845 *Glouchtenko* [*Gluščenko*], *I. E. L'hétérogénéité génétique des tissus chez les organismes végétaux.* (*Genetic heterogeneity of the tissues of plant organisms*). (*pp. 159–65*).

In order to illustrate the use that Mičurinists have made of the genetic heterogeneity of plants for the improvement of crops, experiments with potatoes, sugar beet and cereals are briefly mentioned. Changing environmental conditions, graft hybridization and sexual hybridization may be used to induce or augment genetic heterogeneity in a plant.

3846 *Jacquard, P. Effets du traitement à l'ypérite de semences de blé.* (*The effects of treating wheat seed with yperite*). (*pp. 165–68*).

A mutant of *Triticum durum* var. *leucomelan* 'Mahmoudi 552' was obtained by treating the seed with a 10^{-5} solution of methyl-di-2-chloroethyl-ammonium chloride. The mutant had a contracted appearance, the ear being much more compact than in the usual form.

3847 *Urban, S. Sur la détermination du sexe chez quelques espèces de pin.* (*On the determination of sex in some species of pine*). (*pp. 168–72*).

Observations made on several species indicated that sex is usually determined phenotypically and related to the growth rate. Unisexual forms of various species have also been noted; in these cases sex determination may be genotypic.

3848 *Riley, R. Species relationship in* Secale. (*pp. 174–76*).

[Cf. XXVI, 367].

3849 Chiarugi, A.
Centro di studio per la citogenetica vegetale. Attività svolta durante gli anni 1952–57. **(Centre for the Study of Plant Cytogenetics. Activities during the years 1952–57).**
Ric. sci. 1957 : **27** : 3265–91.

A quinquennial report is given of the work of the above institute. Most of the work referred to has been published already and has been summarized *passim* in *Plant Breeding Abstracts*.

3850 Dolgušin, D. A.
(At the T. D. Lysenko All-Union Plant-Breeding and Genetics).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 9 : 3–12. [Russian].

[Cf. XXVII, 2616–2626].

3851 Marinič, P. E.
(Achievements in breeding agricultural plants).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 11 : 78–89. [Russian].

This survey of plant breeding in the USSR since 1917 lists many standard varieties of cereals, grasses, leguminous forage plants, potato, sugar beet, cotton, flax and vegetables, including cucurbits. Brief descriptions are given of some recent varieties, for instance the wheat Bezostaja 4 [Awnless 4] and the sugar beets V031 and V038. [Cf. 1262–3].

3852 Sizov, I. A.
(Plant resources in the service of agriculture in the USSR).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk. Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 10 : 1–7. [Russian].

The breeding value of the plant material in the collection of the Institute of Plant Industry is discussed. The wheat collection has recently been augmented by introductions of large-grained and early-ripening hard forms from the Mediterranean area and soft wheats from Western Europe, Tunisia, Argentina, China and India, interesting on account of round grain, early maturation and resistance to lodging or *Puccinia*. Hybridization work with maize, barley, potato and other crop plants involving material from the collection at the institute is referred to briefly. The results include maize double-crosses and top-crosses which outyield ordinary varieties by 6–10 c. per ha., barley varieties resistant to *Phytophaga*, *Helminthosporium*, *Erysiphe* or drought, and potato varieties which ripen tubers in the subarctic regions and yield up to 250 c. per ha., crop twice a year in the southern districts or show resistance to *Synchytrium* or *Phytophthora*. The potatoes were obtained by interspecific hybridization with vegetative rapprochement as an auxiliary method for overcoming incompatibility. The wild species used included *Solanum boyacense*, *S. rybinii*, *S. kesselbrenneri* and *S. andigenum*. The last-mentioned species is being used in breeding varieties with improved protein content or resistant to nematode and Colorado beetle.

3853 Sizov, I. A.
(At the USSR Institute of Plant Industry).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 28–39. [Russian].

An extended account of a report already summarized is given [3852].

3854 Aleksandrova, L. N., Ščegolev, V. N., Dmitročenko, A. P. & Polevickij, K. A.
(At the Leningrad Agricultural Institute).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 48–52. [Russian].

Among the practical achievements of breeding new varieties of cereals and potatoes are the winter wheat Obil'naja [Abundant] and the rye Izumrudnaja [Emerald]. Both are characterized by large grain, good baking quality, lodging resistance and a habit suitable for combine harvesting. They outyield the standard varieties for the Leningrad, Pskov and Novgorod provinces by up to 3 c. per ha. New varieties of potato resistant to *Phytophthora* and wart have been obtained by interspecific hybridization.

3855 Kabanov, P. G.
(Makers of new varieties).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 24–35. [Russian].

Breeding at Saratov with the following crops is reported.

Wheat. Two new spring varieties, the soft wheat Saratov 33 (Kitchener x Lutescens 62) and the hard wheat Saratov 34, are described. The former is a strong-floured variety resistant to lodging, shedding and *Ustilago*; it ripens earlier than Lutescens 758 and outyields it under irrigation and rainfed conditions. The latter variety shows improvements in earliness and yield over Hordeiforme 432 and equals it in baking quality. New winter wheats have been obtained by hybridization between rye and wheat, by intercrossing such hybrids or crossing them with wheats. They include Lutescens 230, a strong wheat combining resistance to drought with high yield, firm straw and large grain. Saratov 3 (Hostianum 237 x *Triticale* 'Lutescens 434/154'), Saratov 4 (Lutescens 230 x Lutescens 434/154) and the hybrid Petrovskaja 7 x Lutescens 230 have reached an advanced trial stage. All three are highly productive and hardy. In addition to these, some white-grained wheats were obtained by training Sarrubra for the winter habit.

Rye. Volžanka [rye from the Volga] was obtained by intervarietal open pollination of Eleseevskaja; Saratovskaja Krupnozernaja [Saratov Large-grained] was raised by restricted open pollination of Volžanka with some unspecified large-grained ryes. Volžanka is hardy, drought resistant and moderately resistant to fungi. The other variety outyields Volžanka, has a longer ear and larger grain and sets more grain.

Millet. Kremovoe 311 [Cream-coloured 311] was selected from a Kazah land variety. It is characterized by late maturity, drought resistance and good technological properties of the grain. It is more productive than Saratov 853.

Oil plants. A new *Camelina* variety, Saratovskij Ozimyj [Winter Saratov], was obtained by training the spring type R2 for the winter habit. It yields appreciably more seed and oil per unit area than the standard Zavolžskij [Transvolga]. Among the new mustard varieties, Saratov is notable for high yield and variety 64 for a high content of mustard oil. Two sunflower varieties, Saratovskij Skorospelyj [Saratov Early] (VNIIMK1646 [Oil Plants Institute 1646] x Saratov R27) and Saratovskij Krupnoplodnyj [Saratov Large-seeded], have been bred. The former variety combines earliness with a high oil content while the latter is a large-seeded chewing type with a high oil yield per unit area.

3856 Čenykaeva, E. A.
(The results of viewing vegetables at the USSR Agricultural Exhibition).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 3 : 25–28. [Russian].

The beetroot variety Bordeaux 237 is mentioned for good flavour and absence of concentric white rings; the carrot Nantes 4 has excellent flavour. Among the cabbages, Moskovskaja Pozdnjaja 15 [Moscow Late 15] is quoted as the best variety for preparation of sauerkraut, and Slava Gribovskaja 231 [Gribovo Glory 231] and Slava 1305 are described as high-yielding mid-season types resistant to drought.

3857 Pejve, Ja. V. [Peive, J.]
(Agricultural science in Latvia).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 14–22. [Russian].

Mention is made of breeding work with agricultural and horticultural plants and some high-yielding varieties of cereals, grasses, leguminous forage plants and potatoes which have been bred at the Stend and Priekuli Research Stations are listed.

3858 Jordbruksförsök under 50 år. **(Agricultural research during 50 years).**
Medd. Jordbruksförs. 1957 : No. 88 : Pp. 207.

Lists of the papers published by the Agronomy Department of the Central Institute for Agricultural Research in Sweden during 1907–38 and by its successor, the National Agronomy Experiment Station, during 1939–57 are presented. Summaries of the main papers published during 1907–38 are included.

3859 Ólafur Jónsson
Skýrsla um gróðurtilraunir á Eiðum. **(Report on growth trials at Eiðar).**
Rit Búnadardeildar : Ser B. 1957 : No. 10 : Pp. 99.

The results of 22 experiments conducted during the above period at Eiðar, Iceland, mostly on fertilizer treatments, are reported and include data from varietal trials of forage oats, fodder turnips and potato.

3860 Árni Jónsson
Skýrslur tilraunastöðvanna. 1953–54. **(Reports of the experiment stations, 1953–54).**
Rit landbúnaðardeildar : Ser. A. : 1955 : No. 11 : Pp. 105.

Data are included on the performance of varieties of grasses, clovers, barley, oats, potato and swede at various stations in Iceland.

3861 Verslag van het landbouwkundig onderzoek in Nederland, 1956. **(Report on agricultural research in the Netherlands, 1956)** : Pp. 146.

In the reports of the breeding projects and varietal trials in progress at various institutes in the Netherlands, the following results are mentioned.

Wheat. At the Institute for Research on Plant Diseases, Wageningen, a new physiological race of yellow rust attacking the otherwise highly resistant wheat Chinese 166 has been found. The resistant variety Leda has been found susceptible to attack by a new race of loose smut.

Rye. In breeding diploid rye at the Plant Breeding Foundation, top-cross tests have given almost identical results with polycross tests. Fertility in tetraploids has reached 78% as a result of selection.

Barley. At the Agricultural College, the varieties Minerva and Vada, from *Hordeum laevigatum* x *H. sativum*, have attracted attention as productive fodder barleys. At the Central Bureau, productive spring selections resistant to loose smut have been found.

Cocksfoot. Four plants lacking siliceous teeth have been selected from the first inbred generation of a smooth-leaved clone at the Plant Breeding Foundation.

Ryegrass. At the Plant Breeding Foundation, increases in dry matter content have been obtained in the progeny of crosses between perennial and Italian ryegrass. Tetraploids of both species are characterized by quicker early development, more rapid cover of the ground, brighter leaf colour, lower dry-matter content, higher protein content and higher yield of dry matter.

Red clover. A mixture of families selected for resistance to nematode has proved almost free from attack in the field.

Lupin. Lines homozygous for factors for resistance to mildew and *Fusarium*, rapid growth and absence of alkaloid have been developed at the Plant Breeding Foundation.

Turnip. From work carried out at the Plant Breeding Foundation, it appears to be possible to use inbreeding as a basis for hybrid production. Families showing almost complete resistance to club root have been obtained from resistant individuals. It has also been found that by means of single plant selection families with a dry-matter content in the root 20–25% higher than in standard varieties may be obtained.

Three physiological races of *Plasmodiophora brassicae* have been distinguished, viz. a cabbage race, a turnip race and a swede race.

Potato. Among South American potatoes studied at the Plant Breeding Foundation, three are resistant to potato root eelworm and others resistant to slight frosts. Some Netherlands varieties have remained free from attack by race G of the wart pathogen. In tests of numerous seedlings, a large proportion were blight resistant and some of these appeared to be resistant to root nematode too.

Blight-resistant potatoes characterized by short-day requirements enabling them to be planted as late crops (stubble potatoes) and showing good keeping quality under transport have been developed.

Flax. Indications that resistance to rust and smut may be combined with straw stiffness and quality have been obtained at the Plant Breeding Foundation. Some young lines of linseed giving higher yields than standard varieties have been developed.

Poppy. Material with outstanding seed quality and some resistance to *Peronospora arborescens* has been selected at the Plant Breeding Foundation.

3862 Derde Jaarverslag. Proefstation voor de groenteteelt in de volle grond in Nederland. (**Third Annual Report. Experimental Station for Outdoor Vegetable Growing in the Netherlands**), Alkmaar 1957 : Pp. 80.

Besides the work described below, varietal trials of numerous vegetable crops have been carried out.

Potato. Crossing and selection for leaf and tuber type and for resistance to blight, wart and root eelworm continued.

Cabbage. Varietal differences in tendency to a disorder appearing as a ring of discoloration at some distance from the heart when the head is cut open have been observed and selection for resistance to the disorder has begun.

Phaseolus. Among crosses effected with the aim of obtaining material resistant to anthracnose, *Ph. vulgaris* x *Ph. dumosus* has yielded a proportion of resistant plants, some of them with good pod form.

Descriptions are given of seven species forming part of the collection at the station; of these, *Ph. mungo*, *Ph. lathyroides*, *Ph. acutifolius* and *Ph. atropurpureus* have been crossed with *Ph. vulgaris*. Crosses among climbing, dwarf and runner beans have also been carried out.

Pea. A marrowfat type resistant to *Fusarium oxysporum* f. *pisi* has been developed from a cross between the maple pea Vinco and the garden pea Keuls Wonder. It ripens late and is somewhat susceptible to mildew but is expected to be of use as a parent.

3863 Proefvelden van officiële instellingen. (**Trial fields of official institutions**). Zaadbelangen 1958 : **12** : 134–38.

Proefvelden van bedrijven. (**Trial fields of private firms**).
Ibid. 1958 : **12** : 138–43.

The names and addresses of organizations conducting trials in the Netherlands are given together with notes on trials in progress.

3864 Plantenveredeling voor 35 jaar en nu. (**Plant breeding 35 years ago and now**).
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1958 : **14** : p. 130.

The expansion of breeding work in the Netherlands since 1922 is briefly surveyed, with special reference to the increased number of breeding institutes and laboratories.

3865 Dorst, J. C.
A quarter of a century of plant breeding in the Netherlands.
Euphytica, Wageningen. 1958 : **7** : 9–20.

Crop breeding in the Netherlands is surveyed with reference to: changes in the varieties available for cultivation since 1932; modern methods, such as the introduction of resistance to diseases and pests into cultivars from various sources of germ plasm, or polyploidization; improvement of equipment; organizations concerned with providing advice and material support to breeders; and other developments, such as the measures taken to safeguard the breeder's rights.

3866 Station de recherches de l'état pour l'amélioration des plantes de grande culture, Burg.s Van Gansberghelaan, Lemberge. (**The State Research Station for the Improvement of Crop Plants, Burg.s Van Gansberghelaan, Lemberge**).
Rev. Agric., Brux. 1958 : **11** : 269–72.

An outline is given of the organization of plant breeding at the above station and some of the varieties produced there are listed.

3867 Pavlov, K.
(**The influence of Soviet agrobiological science upon progress in breeding cultivated plants in Bulgaria**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 11 : 136–42. [Russian].

Mention is made of introductions of Soviet varieties of industrial and crop plants for breeding purposes in Bulgaria. Bulgarian breeding results include the sunflower Tolbuhin 75, selected from Ždanov 6432, which is resistant to *Orobanche*, and the water melon Mramornyj [Marble], said to be the best Bulgarian variety; the latter was bred from a water melon originating from Astrahan'.

Annual Report of the National Institute of Genetics, Japan 1956 (1957) : No. 7 : Pp. 105.

3868 *Kihara, H. Studies on the substitution and restoration of the nucleus.* (*p. 36*). [Cf. XXVII, 1442].

3869 *Matsumura, S., Muramatsu, M. & Sakamoto, S. Cytogenetical studies on* F_1 *hybrids of* Agropyron *and* Triticum *and* Aegilops. (*pp. 36–37*).

In hybridization between *Triticum* and *Agropyron*, the crosses most easily effected were between the Emmer wheats and *Agropyron* spp. belonging to sect. *Elytrigia*. F_1 hybrids of *A. glaucum* with *T. polonicum*, *T. durum*, *T. dicoccum* and *T. pyramidale* were nearly or completely sterile. Metaphase-I configurations ranged from $29_{I} + 3_{II}$ to $11_{I} + 12_{II}$, the mode for the bivalents being 7–8. F_1 *T. vulgare* x *A. glaucum* was sterile and had configurations varying from $26_{I} + 8_{II}$ to $16_{I} + 13_{II}$, with the mode 11_{II}. Hybrids of *A. glaucum* with *Ae. longissima*, *Ae. cylindrica* and *Ae. variabilis* were sterile, the range of configurations being respectively $15_{I} + 5_{II} + 1_{III}$ to $8_{I} + 10_{II}$, $21_{I} + 4_{II} + 2_{III}$ to $14_{I} + 9_{II} + 1_{III}$, and $25_{I} + 5_{II}$ to $15_{I} + 10_{II}$.

3870 *Oka, H.-I. Complementary dominant lethal genes in rice.* (*pp. 37–38*).

Lethality affecting plants from crosses among PTB10, PTB7 and other Indian varieties proved to be dependent on complementary dominant genes, L_1 and L_2 [cf. 1696].

3871 *Oka, H.-I. Genetic basis of hybrid breakdown in rice.* (*pp. 38–39*).

Analysis of a cross between an Indian and a Japanese variety led to the hypothesis that interaction between complementary recessive lethals, a_1 and a_2, was responsible for the lethality shown by some F_2 segregates [cf. 1696], at least two dominant genes, A_1A_1, A_2A_2 or A_1A_2, being necessary for normal growth.

3872 *Oka, H.-I. Hypothesis of "duplicate fertility genes" in rice.* (*pp. 39–41*).

In some crosses between distantly related varieties, seed-sterile F_1 segregates appear, although the F_1 is completely fertile. Data obtained by crossing and back-crossing two *indica* varieties were explicable by assuming that fertility depends upon duplicate loci. As in the parallel case of normal growth in the F_2 of another cross [3871], two dominant alleles, A_1A_1, A_2A_2 or A_1A_2 were regarded as necessary for fertility. A slight difference has however been detected between $A_1a_1a_2a_2$ and $a_1a_1a_1a_1$ plants, the former showing better growth or higher fertility.

3873 *Tateoka, T. Karyosystematic studies in Poaceae, IV. (pp. 41–42).*

The following $2n$ numbers are reported: *Brylkinia schmidtii, Astrebla lappacea, A. pectinacea, Mosdenia phleoides* and *Coelachne japonica*, 40; *Diarrhena japonica, D. fauriei*, 38; *Tripogon japonicus, Schizachne purpurascens*, 20; *Cleistachne sorgoides*, 36; *Themeda triandra*, 30; and *Ehrharta calycina*, 24. The systematic position of the genera *Phaenosperma*, *Garnotia* and *Thysanolaena* is also considered on the basis of morphology and cytology. [Cf. XXVII, 3829].

3874 *Takenaka, Y., Amano, Y. & Tateoka, T. Cytogenetic studies on the genus* Nicotiana, *IX. (pp. 42–44).*

Metaphase was studied in F_1 hybrids of *N. gossei* ($n = 18$) x *N. longiflora* ($n = 10$), *N. gossei* x *N. plumbaginifolia* ($n = 10$), *N. paniculata* ($n = 12$) x *N. tabacum* ($n = 24$) and *N. megalosiphon* ($n = 20$) x *N. tabacum.* The frequencies of bivalents in the four hybrids were respectively 0–3, 0–4, 0–4 and 1–8, the corresponding modes being 1, 2, 1 and 3–4. The observations are discussed with reference to possible allosyndetic and autosyndetic affinities. [Cf. XXVII, 3821].

3875 *Furusato, K. & Miyazawa, A. Crossing experiments with* Citrullus vulgaris *Schrad. and* Citrullus colocynthis *Schrad. (pp. 45–47).*

Viable seeds were obtained from *C. colocynthis* ($2x$) x *C. vulgaris* ($2x$), *C. colocynthis* ($2x$) x *C. vulgaris* ($4x$) and the reciprocal and *C. vulgaris* ($4x$) x *C. vulgaris* ($2x$). Only empty seeds were secured from *C. vulgaris* ($2x$) x *C. colocynthis* ($2x$) and *C. vulgaris* ($2x$) x *C. vulgaris* ($4x$). F_1 hybrids from the first cross formed 11_{II} at metaphase I. The F_2 of this cross segregated with a ratio of 9 : 7 for white *vs.* nonwhite flesh colour, while bitterness depended on one dominant gene and black and intermediate *vs.* white seeds on two or more duplicate genes.

3876 *Lilienfeld, F. A. & Kihara, H. Dextrality and sinistrality in plants. (p. 47).*

Clockwise coiling of the pods in *Medicago tuberculata* and *M. litoralis* is dominant over counterclockwise coiling.

3877 *Matsumura, S. Attempt to use disease-resistant American varieties in triploidy breeding of sugar beets. (pp. 47–48).*

The sugar yield of triploids derived from crosses of $4x$ Honiku 398 with $2x$ Honiku 192 and 390 and with the $2x$ disease-resistant American varieties GW 304 and 443 exceeded that of $2x$ GW443. The triploids having the Honiku varieties as parents were however markedly more susceptible to diseases than GW443.

3878 *Matsumura, S. & Sakamoto, S. How to improve seed production of triploid sugar beets. (pp. 48–49).*

From a study of mixed sowings of $4x$ and $2x$ seeds in different proportions it was concluded that a ratio of 5 : 1 is the most suitable for the large-scale production of $3x$ seed by farmers. The proportion of $3x$ seedlings thus obtained was 46·5%. The $2x$ seeds usually germinated earlier than the $3x$ and $4x$; roguing would thus be facilitated. In order to obtain a still higher percentage of triploids, identification of seeds and seedlings with the aid of dominant markers, together with the development of parents with a higher degree of self incompatibility, should be attempted.

3879 *Abe, Y. & Gotoh, K. Anthocyanin in the fruit-coats of two varieties of egg-plant, Burma and Black Beauty. (pp. 49–50).*

Previous investigations, in which use was made of paper chromatography, revealed that acylation of the anthocyanin molecule, which occurs in Burma but not in Black Beauty, is determined by a single dominant gene [XXVII, 3830]. Subsequent chemical analysis has shown that the pigment of Burma is a derivative of p-hydroxycinnamoyl delphinidin 3,5-diglucoside combined with rhamnose, whereas the pigment of Black Beauty is delphinidin 3-glucorhamnoside.

3880 *Ogawa, Y., Endo, T. & Abe, Y. Chemistry of the bitter substance in the fruits of* Citrullus colocynthis, *Schrad. (pp. 51–52).*

In an analysis carried out in conjunction with a study of the inheritance of bitterness, the bitter substance was crystallized as a p-nitrobenzoyl ester.

3881 *Sakai, K.-I. & Iyama, S. Statistical studies on the breeding behaviour of wild populations of* Setaria pumila. *(pp. 53–55)*

A sample of *l* plants was taken and from each of these *m* progeny were raised and *n* caryopses measured for each of the progeny. Analyses of variance were made for length and width of seed (1) between parents, (2) between offspring and parents and (3) within offspring.

3882 *Sakai, K.-I. & Iyama, S. Genetical studies on the cherry-red leaf in tobacco plants. (pp. 55–57).*

In further investigations on postharvest reddening, highly significant variation was found between groups of lines but not among lines within the groups [cf. XXVII, 3822]. Data from F_1 interline hybrids showed that only a slight effect of dominance, if any, was expressed.

3883 *Oka, H.-I. Change of genetic variance in quantitative characters due to change of gene frequency in hybrid rice populations. (pp. 58–60).*

Formulae are derived for the variance of the F_2-F_4 generations of an autogamous population in terms of D, H, and E components and a component $X = \bar{x}^2$, where x represents the difference in frequency between AA and aa plants due to selection. An analysis of F_2-F_5 bulk-propagated progenies of the rice cross Pei-ku x Tai-chung 65 showed that the effect of the X component was highly significant.

3884 *Oka, H.-I. A method to estimate the effect of linkages between polygenes in autogamous plants. (pp. 60–62).*

Simplified formulae for F_2-F_5 variances in terms of D, H and E components and assuming that the effect of linkage is only conspicuous when the recombination value is around 0·25 are presented. By using F_2-F_3 data on length of various organs in the progenies of the cross referred to in the previous abstract, expected variances in the F_4-F_6 were calculated. The observed F_4-F_6 variances differed widely from the expected, assuming no linkage and no selection, but the deviations could be greatly reduced by applying the formulae for the effect of linkage mentioned in this abstract and for the effect of selection referred to above.

3885 *Gotoh, K. Genotypic correlations among five economic characters in egg-plant. (pp. 62–63).*

[Cf. XXVII, 3557].

3886 *Gotoh, K. Genetic variation in heading date in a local variety of barley, "Aokei No. 14". (p. 63).*

The author has previously pointed out that variation in heading date of Hosogara 2 [XXVI, 2327–8] and Iwate Mensury 2 [XXVII, 3816] is due mainly to genetic heterogeneity. Additional data have been obtained on Aokei 14. The parent-progeny regression coefficient for heading date was 0·785. The variety consists of two types, one being early-maturing and erect and the other prostrate. Within each type heading date is variable. Aokei 14 is also heterogeneous with respect to the presence or absence of hairs on the leaf sheath, 53·3% of the plants being pubescent. No association was detected between hairiness and time of maturity.

3887 *Sakai, K.-I. Method of estimation and use of genetic correlation in forest-tree breeding. (pp. 64–65).*

[Cf. 3417].

3888 *Sakai, K.-I. Application of the coefficient of relationship in the breeding of autogamous plants. (65–66).*

[Cf. 2447].

3889 *Sakai, K.-I. & Narise, T. Competition between different species and species hybrids in* Nicotiana. *(pp. 67–68).*

The competitive ability of the following in relation to *N. tabacum* 'Bright Yellow' was determined: *N. sylvestris*, *N. tomentosiformis*, *N. debneyi*, F_1 and amphidiploid Bright Yellow x *N. sylvestris*, the back cross of this amphidiploid with Bright Yellow, F_1 *N. sylvestris* x *N. tomentosiformis* and amphidiploid *N. debneyi* x Bright Yellow. Plant height, capsule number, plant weight and leaf number were recorded for Bright Yellow on an individual plant basis in unmixed and mixed plots. It was concluded that the competitive ability of a hybrid in comparison with its parental species varies according to the component species and that doubling of the chromosomes in the F_1 to produce an amphidiploid decreases competitive ability.

3890 *Sakai, K.-I. & Oka, H.-I. Competitive ability of barley varieties at various fertility levels of the soil. (pp. 68–70).*

In an experiment on seven varieties the effect of competition became more significant at higher levels of fertility.

3891 *Oka, H.-I. & Sakai, K.-I. Correlation between competitive ability and other characters in hybrid populations of rice. (pp. 70–71).*

Investigations on F_{10} strains of PTB10 x Kinoshita glutinous rice and F_9 strains of Pei-ku x Tai-chung 65 provided no evidence that competitive ability against a tester variety was correlated with agronomic characters. Strains with characters similar to rices of the Continental group tended to possess higher competitive ability than strains with features characteristic of the Insular group. This tendency was particularly marked in the case of the red coloration of the testa (*Rc*) found in the Continental group.

3892 *Matsumura, S. & Fujii, T. Genetic effects of ionizing radiation in einkorn wheat. (pp. 84–86).*

The effects of treating seeds of *Triticum monococcum* var. *flavescens* with X rays, γ rays and fast neutrons were investigated in relation to germination rate, seedling growth, fertility, chromosome aberration in the R_1 and chlorophyll mutation in the R_2. The frequency of chromosome aberrations increased in proportion to the dosage of γ rays and neutrons. The X-ray treatment consisted of different wave lengths at the same dosage (10 Kr.) and intensity (82 r. per min.). The frequencies of chromosome aberrations were unexpectedly high and low at 20 KVP and 50 KVP respectively [cf. XXVII, 2198].

3893 *Matsumura, S., Fujii, T. & Kondô, S. Effects of X- and γ-radiations upon wheat seedlings and their modification due to temperature or polyploidy. (p. 86).*

The criteria studied were germination rate and seedling growth. In the experiment concerned with the relationship between radiosensitivity and polyploidy, seeds of *Triticum monococcum, T. durum* and *T. vulgare* were exposed to X and γ rays at a dosage of 10–40 Kr. *T. monococcum* was the most and *T. vulgare* the least sensitive to the two types of radiation. No significant difference was however detected between *T. vulgare* and *T. durum.*

3894 *Matsumura, S. & Fujii, T. Mutants in tobacco plants induced by X-rays and their application. (pp. 87–88).*

Three X-ray-induced mutants of Bright Yellow, respectively described as early, pubescent and yellowish green, have shown promise with respect to leaf quality and may prove to be of practical value. "Round leaf" mutants resulting from treatment of Dixie Bright with 30,000 r. at 180 KVP and "broad leaf" mutants occurring in the progeny of Dixie Bright pollinated with irradiated pollen of Bright Yellow exhibited a high degree of resistance to white fleck.

3895 *Fujii, T. Studies on chlorophyll mutants in diploid wheat induced by radiation. (pp. 88–89).*

Further studies on X-ray-induced chlorophyll mutants of *T. monococcum* var. *flavescens* are reported. The *chlorina* and *basi-viridis* II mutants were each controlled by a recessive gene [cf. XXVI, 3177]. The chlorophyll content in both mutants amounted to about 50% of that in normal plants. When exposed to fluorescent light in a phytotron at 20° C., *basi-viridis* II, but not *chlorina*, gradually became normal in chlorophyll content [cf. XXVII, 392]. The chlorophyll content of double recessives for these mutations was about 20% of the normal amount under field conditions, a high degree of mortality being observed. When these plants were grown in the phytotron, the chlorophyll content was restored to the level characteristic of *chlorina.* Possibly the gene for *chlorina* is epistatic to that for *basi-viridis* II. The crosses *virido-albina* x *basi-viridis* II (both parents having ability to recover chlorophyll content), *virido-albina* x *chlorina* and *chlorina* x *striata* (neither parent possessing capacity to recover) were effected. All the F_1 plants were normally green. When *chlorina* was X-irradiated, the percentage of chromosome aberrations in the X_1 and of chlorophyll mutations in the X_2 was higher than in the treated normal controls. In the X_1, the *chlorina* strain showed a more marked decrease in fertility with increase in dosage than normal plants. Included in the same experiment, the "slender" mutant did not show the trends displayed by *chlorina.*

3896 *Iino, T. & Lederberg, J. Transductional analysis of phase variation in* Salmonella. *(pp. 89–91).*

[Cf. XXVII, 1041].

3897 *Kimura, M. Random genetic drift in a triallelic locus; exact solution with a continuous model. (pp. 93–94).*

[Cf. XXVII, 1080].

3898 *Kimura, M. Selection in a finite population (case of complete dominance). (p. 94).*

An extension of the author's analysis of the interaction between natural selection and random genetic drift to the case where A is completely dominant to A' and has a selective advantage s over it is made. It was found that for $s > 0$ the rate of decay is decreased and conversely for $s < 0$.

3899 *Kimura, M. Probability distribution of gene frequencies in natural populations. (pp. 95–96).*

Wright [IX, 119] derived a formula for the probability distribution of a gene frequency, x, at the steady state. The author considers the bivariate case of two frequencies, x, y, on which no constraints are imposed, and shows that under certain conditions the steady state distribution is given by $\phi\ (x, y) = Ce^{\psi}$, where $\phi\ (x, y)$ is the probability density of x, y at the steady state, C is a constant determined by $\iint \phi dxdy = 1$ (terminal classes excluded), and $d\psi$ is an exact differential defined in terms of the conditions referred to above.

3900 *Kimura, M. The rate of change of population fitness by natural selection. (pp. 96–97).* [Cf. 3688].

3901 *Kimura, M. A model of a genetic system which leads to closer linkage by natural selection. (p. 97).*

[Cf. XXVII, 1084].

3902 **Annual Report of the Indian Council of Agricultural Research for 1954–55.** 1957 : Pp. 175.

Polyploidy. Diploid and polyploid seedlings (species not given) were compared with respect to alkaline phosphate and riboflavin content and acid phosphatase, amylase and peroxidase activity and riboflavin content.

Wheat. Many of the hybrid selections tested in various regions exhibited promise in rust resistance.

Maize. Progress was made in work in connexion with developing hybrids in several states.

Pennisetum. F_1 hybrids of inbreds of *P. typhoideum* exhibited superiority in grain yield over local strains in Madras.

Most of the hybrids between *P. typhoideum* and *P. purpureum*, which have been studied at the Indian Agricultural Research Institute for their potentialities for forage, were perennial and completely sterile.

Sorghum. In the scheme on *Striga*-resistant strains in Madras, Co. 11 has proved to be highly resistant. AS4003, of African origin, has been used in crosses of local sorghums on account of its resistance to this parasite.

Rice. Breeding in nearly 15 schemes included the following. In progeny tests in the Punjab, selections of Jhona Kasarwala gave marked increases in yield over the standard, selections of the Palman type giving the next best performance. Some introduced varieties outstanding in earliness and lodging resistance are being utilized as parents.

At the Central Rice Research Institute, Cuttack, *japonica* varieties gave hybrids with greater spikelet fertility in crosses with *indica* parents from Uttar Pradesh, Punjab, Bombay, Madhya Pradesh and China than in those from southern India. Fertility was affected by environment and in some cases by the cytoplasm. Even in the case of combinations with a high degree of F_1 sterility, satisfactory fertility has been secured in the F_2.

The long-duration varieties Co. 25, Co. 26 and ADT25 and short-duration variety TKM1 were distributed in Madras on account of their blast resistance and other desirable features. Co. 4 has proved to be valuable as a parent in conferring resistance to this disease.

Coix. In *C. aquatica* ($n = 5$), two nucleolar-organizing chromosomes have been distinguished. Bivalents at diakinesis are of the ring type, separation at metaphase being normal. *C. lachryma-jobi* ($n = 10$) is being compared meiotically with *C. aquatica*. Hybridization between maize and *C. lachryma-jobi* has been attempted.

Cassava. Hybridization among many varieties was undertaken in Travancore-Cochin.

Fruits. At the Government Fruit Research Station, Saharanpur, UP, the mango varieties Dasehri and Totapari Hyderabad were crossed to impart the habit of regular bearing of the latter to the former. Hybridization involving varieties such as Dasehri, Langra, Sufeda, Alfonso, Benishan, Rumani and Swarnareka was effected at the Hyderabad Fruit Research Station.

Breeding at the last-mentioned station also included crossing of *Annona squamosa* with *Annona* spp. and use as parents of the grapes Bangalore Blue, Champaneh, James, Large White, Oval White and Trentham Black which are resistant to downy and powdery mildew.

International Symposium on Genetics and Plant Breeding in South Asia, sponsored by the Indian Society of Genetics and Plant Breeding and UNESCO South Asia Science Co-operation Office, New Delhi, January 1957.

Indian J. Genet. 1957 : **17** : 111–421.

3903 *Uppal, B. N. Inaugural address. (pp. 111–19).*

The application of genetics in crop breeding is considered, examples being given of the improvement of crops grown in India. Comments are also made on the broader implications of genetics in relation to biology, human variation and atomic radiation.

3904 *Stebbins, G. L. The use of plant breeding to increase the world's food supply. (pp. 120–28).*

A general review is given of the economic role and of some of the modern methods of breeding.

3905 *Stebbins, G. L. Genetics, evolution and plant breeding. (pp. 129–41).*

The contributions of genetics and evolutionary concepts to the development of breeding techniques are surveyed, with particular reference to the exploitation of heterosis, polyploidization, and intervarietal and interspecific transference of resistance to diseases and pests.

3906 *Ramiah, K. Rice breeding in south Asia. (pp. 142–47).*

The topics considered are (1) the position with respect to the commercial use of improved varieties and the organization of seed schemes, (2) breeding aims and methods, (3) variation in *Oryza sativa* and (4) the activities of the International Rice Commission organized by FAO. It is mentioned that a survey of a small area in the Jaipur tract of Orissa is now in progress, since it is considered that this region may be a secondary centre of origin of *O. sativa.* Initial work has shown that the area contains a rich diversity of varieties, some of which appear to possess morphological variations not found in known varieties. A few have the *japonica* type of grain.

3907 *Pal, B. P. Breeding improved varieties of wheat and barley.* (*pp. 148–55*).

Progress in wheat breeding in India is summarized with respect to early maturity, response to heavy manuring, ear and grain characters, nutritional properties, quality for milling, baking and chapati manufacture, yield, resistance to lodging, drought and diseases, and improvement of *Triticum durum.* The results of barley improvement, mainly by pure-line selection of indigenous material, are also outlined. Recommendations are made concerning future projects on both crops.

3908 *Chavan, V. M. & Shendge, P. Y. Plant breeding in south Asia with reference to millets.* (*pp. 156–75*).

Chiefly with reference to India the authors review breeding of the following crops and the techniques employed: *Sorghum vulgare, Pennisetum typhoides, Eleusine coracana, Setaria italica, Paspalum scrobiculatum, Panicum crus-galli, P. miliaceum* and *Echinochloa frumentacea.* An appendix provides a list of the improved strains of millets developed in India, with information on number of days between sowing and harvesting and on yield.

3909 *Mehta, T. R. Production of hybrid maize.* (*pp. 176–79*).

Although most of the introductions from the USA, S. America, Mexico and Africa so far tested have proved to be somewhat lacking in adaptability, a few have outyielded local varieties at several centres and would be acceptable except for their long duration (about 90–95 days). It is suggested that introductions from more humid regions should be tested. As the result of work in the last decade, double-cross hybrids have been developed at some stations. American inbreds have been used as parents at only one centre. A coordinated and extended programme of hybrid breeding in India has now been planned. In view of the agricultural conditions now prevailing it is however suggested that use of synthetics may be more feasible until these conditions are improved.

3910 *Sikka, S. M. Breeding new varieties of fibre crops.* (*pp. 180–96*).

Breeding of cotton, jute, *Hibiscus cannabinus* and *H. sabdariffa* is surveyed, mainly with reference to India and Pakistan. Lines of future work are suggested. Mention is also made of a number of other fibres which are grown in south-east Asia and which have so far received little attention by breeders.

3911 *Pushkarnath. Breeding potato varieties in south Asia.* (*pp. 197–211*).

The problems of failure to flower under unfavourable conditions and of sterility are discussed, and the value of selection, intervarietal and interspecific hybridization, inbreeding and exploitation of natural and induced mutation as methods of improvement is assessed, with special reference to south-east Asia. The following specific problems confront breeders in this region: field resistance and field immunity to late blight; resistance to early blight, charcoal rot (*Macrophomina phaseoli*), leaf roll and viruses X, Y and A; earliness; capacity for tuber production at high temperatures; adaptability within a single variety to different photoperiods; and keeping quality in connexion with the production of seed potatoes. Ways in which these problems may be tackled are indicated, with reference to breeding in India.

3912 *Abraham, A. Breeding of tuber crops in India.* (*pp. 212–17*).

A report is given on work at Kerala University, India.

In cassava breeding, promising selections have been obtained from intervarietal hybrids. The best method of improvement appears however to be hybridization between inbreds. The fourth back-cross generation of cassava ♀ x *Manihot glaziovii* ♂ to cassava is almost similar to the recurrent parent and combines such characters as high yield, increased vigour, drought resistance and spreading growth habit of the tubers. The back crosses equal ordinary cassava in quality but chemical analysis of the tubers is necessary. All the cultivated varieties so far studied have $2n = 36$ and highly regular meiosis. Colchicine-induced tetraploids were inferior in yield to the diploids. Triploids from tetraploid ♀ x diploid ♂ crosses have however so far surpassed the diploids.

In sweet-potato improvement, selections from intervarietal hybrids are undergoing yield trials. By training the plants on trellises, applying

P fertilizer and profusely watering, flowering has been induced in most varieties within two months after planting the cuttings. Most varieties have however shown a high degree of sterility, which is attributed to the high degree of polyploidy ($2n = 90$). Eighteen other species of *Ipomoea* have $2n = 30$, while in *I. repens* and *I. uniflora*, $2n = 60$. The cross between the sweet potato and the tuber-forming wild species *I. paniculata* ($2n = 30$) failed. An attempt is now being made to synthesize a type by crossing *I. paniculata* with *I. repens* and doubling the chromosome number of the F_1 hybrid, so as to facilitate crossing with *I. batatas*.

Preliminary work on the induction of mutants of cassava and sweet potato by X-ray treatment is under way.

Additional crops, such as types of *Dioscorea*, *Colocasia*, *Amorphophallus*, *Coleus* and *Xanthosoma*, are being studied cytologically and in other fundamental aspects, prior to the initiation of breeding.

3913 *Richharia, R. H. Plant breeding with reference to oilseed crops. (pp. 218–47).*

Mainly with reference to work in India and Pakistan, a comprehensive survey is given of the literature on the breeding, genetics and cytology of linseed, sesame, *Brassica* spp., castor bean, groundnut, coconut, safflower, *Guizotia abyssinica* and *Eruca sativa*.

3914 *Kadam, B. S. & Murty, B. R. Breeding new varieties of tobacco. (pp. 248–56).*

Progress achieved in India by selection and intervarietal crossing is outlined and, with reference to the experience of investigators in other countries, the possibilities of improving tobacco by induction of mutation, polyploidization, interspecific hybridization and breeding for resistance by interspecific and intervarietal crossing are assessed. Suggestions are made concerning the main aims of breeding programmes in India.

3915 *Chona, B. L. Sources of resistance to diseases in breeding varieties of sugar-cane. (pp. 257–68).*

In this general survey of information gained in India and other sugar-cane producing countries of the world, the author examines the value of *Saccharum* spp. as sources of resistance to diseases and, referring particularly to red rot, root rot, mosaic and smut, the results of interspecific hybridization.

3916 *Dutt, N. L. & Panje, R. R. Present-day trends in sugarcane breeding. (pp. 269–75).*

A discussion is given of the following ways in which breeders in sugar-cane producing countries are improving or proposing to improve the crop: (1) exploitation of already existing breeding material by recurrent selection of new parents in each succeeding hybrid generation, combined with techniques to increase the number of seedlings; (2) inbreeding and sib-crossing of parents likely to give promising results; (3) elucidation of cytogenetical behaviour in order to place breeding on a more controllable basis; (4) recurrent reciprocal selection as proposed by Tysdal; and (5) collection of new sources of germ plasm.

3917 *Swedish mutation work in relation to plant breeding. (pp. 276–95).*

This review has been compiled by M. S. Swaminathan from data given in a lecture by Å. Gustafsson and in some additional papers. The investigations surveyed, which deal with the induction of mutations by ionizing radiations and chemical mutagens in barley and other crops have already been referred to in *Plant Breeding Abstracts* in summaries of papers published prior or subsequently to the date of this review.

3918 *Swaminathan, M. S. Polyploidy and sensitivity to mutagens. (pp. 296–304).*

The author discusses investigations carried out by himself and his colleagues at the Indian Agricultural Research Institute and by workers in other countries to study various aspects of the sensitivity of polyploids to the mutagenic effects of different types of radiation and chemicals. The limited amount of work so far done in India suggests that among the polyploid crops, wheat and cotton may lend themselves to improvement by induced mutation. Mention is made of plants with nondehiscent anthers obtained from seeds of the cotton 320F which had been treated with 48,000 r. of X rays. In one plant the staminal column was situated separately from the style, emasculation thus being facilitated. These plants proved to be heterozygous for translocations; their progenies are to be studied from the point of view of utilization in producing hybrid seed.

3919 *Joshi, A. B. Genetics of resistance to diseases and pests. (pp. 305–17).*

After a general consideration of (1) variability in the pathogen, (2) the nature and genetical basis of resistance and (3) expression of resistance in relation to environmental conditions, the author summarizes progress made in south-east Asia in research on inheritance of resistance to diseases and pests in rice, cotton and other crops. It is pointed out that the genetics of resistance has so far received little attention in this region, with the exception of some crops in India. Steps requiring to be taken as a basis of breeding for resistance in south-east Asia are suggested.

3920 *Panse, V. G. Genetics of quantitative characters in relation to plant breeding. (pp. 318–28).*

With special reference to work done in India, the present status of the study of polygenic inheritance in relation to crop breeding is reviewed under the headings of (1) heritable variability, (2) discriminant function, (3) effective number of genes and (4) genetic models.

3921 *Ghose, R. L. M. Linkage studies in rice and jute. (pp. 329–35).*

A summary is given of information gained on linkage in rice chiefly by investigators at Coimbatore, India, and on linkage in jute at the Jute Agricultural Research Laboratories at Dacca, now in Pakistan. In the short discussion of future lines of work on rice, attention is drawn to the need of formulae for determining linkage values from the complex segregation ratios obtained for characters governed by three or four genes.

3922 *Frankel, O. H. The biological system of plant introduction. (pp. 336–42).*

[Cf. 2712].

3923 *Singh, H. Genetic stocks of agricultural and horticultural plants of south Asia. (pp. 343–61).*

On the basis of information to be found in the literature, the author takes stock of the genetic material of field crops, fruits and vegetables available in south-east Asia.

3924 *Kumar, L. S. S. Scope and importance of plant introduction in south Asia. (pp. 362–69).*

After outlining some of the results of past introduction into south-east Asia, the author discusses the scope existing in this region for the organization of expeditions to centres of origin in various parts of Asia, cooperation between the different countries in surveying and collection, the establishment of a central gene bank serving the whole region, and the organization of regional stations and a central bureau for plant introduction in each country.

3925 *Asana, R. D. The problem of assessment of drought resistance in crop-plants. (pp. 370–78).*

From an examination of the literature and from experiments carried out on wheat at the Indian Agricultural Research Institute, the author concludes that drought resistance in an annual crop may be satisfactorily assessed on the basis of yield components in pot tests in which the plants are subjected to temporary wilting [cf. XXVII, 425]. Permanent-wilting experiments may however be useful in the case of pasture plants which under natural conditions may be subjected to permanent wilting. Reference is also made to investigations on the relationship of the photosynthetic area during the period after anthesis with yield under conditions of normal water supply and drought.

3926 *Sircar, S. M. Photoperiodic studies in crop plants of south Asia. (pp. 379–85).*

After surveying work carried out in India and other countries on photoperiodic response in rice, wheat, jute and a few other crops and on the effect of light on germination, the author suggests lines of future research on photoperiodism from the standpoints of breeding, genetics and physiology.

3927 *Maheshwari, P. Hormones in reproduction. (pp. 386–97).*

Induction of flowering, modification of sex expression, facilitation of hybridization and other aspects of hormone application which are of interest to breeders are discussed.

3928 Pal, B. P.
Advances in plant breeding and genetics in relation to crop improvement in India in the last twenty-five years.
Emp. J. exp. Agric. 1958 : **26** : 123–35.

The work mentioned in this review includes the breeding of improved disease-resistant varieties of cereals, pulses, oil seeds, fibre plants, vegetables, fruits, plantation crops and tobacco. Mention is also made of genetical studies with rice and wheat, hybridization, polyploid breeding and mutation breeding.

3929 Parmi ceux qui "pensent" l'avenir et le préparent, les chercheurs du Service Botanique et Agronomique de Tunisie. **(Those who consider the future and prepare for it, the investigators of the Botanical and Agronomic Service of Tunis).**
Terre Tunis. indépendante 1958 : unpaginated; also in Arabic.

A brief mention of plant breeding is included in this outline of the work of the above organization.

3930 **Annual Report of the Department of Agriculture, Ghana, for the year 1955–56** (1958) : Pp. 37.

Mention is briefly made of breeding work carried out with rice and millet and of varietal trials with maize, rice, sorghum, yam, groundnut and soya bean.

Maize. Progress has been made in the breeding programme using American weevil-resistant lines. Many of the 106 Carribean and Central American varieties tested at Nyankpala showed promise of high yielding ability or high rust resistance.

Sorghum. A genetical study is to be made of the Nunaba varietal character of nonopening glumes since the results of yield trials indicate that varieties of the Nunaba type are best suited in the Nyankpala region. Crossing has been carried out with a view to developing a dwarf, open-panicled, red-grained type suitable for peto production. Selection of dwarf hybrids at Damongo and progeny row selection at four other stations have been carried out.

3931 **Annual Report of the Agricultural Research of the Federation of Nigeria for the year 1956–57** (1958) : Pp. 48.

Maize. Further work was carried out by the West African Maize Research Unit on the production of inbreds resistant to *Puccinia polysora* and of their top crosses with local varieties and introductions.

Rice. Selection within established and introduced varieties is under way.

Cassava. Mosaic-resistant varieties improved in yield and protein content are the aim of the breeding project in progress, which includes hybridization of cassava with *Manihot glaziovii* and back crossing to cassava.

Cola. Analysis of ten years' data on hybrids within *C. nitida* has indicated a considerable range of variation in yield between families. Improvement in yield resulting from incorporation of the gene complex for high yield associated with red nuts reached a maximum in crosses between trees grown from pink nuts and trees from red nuts. Pink and red colour of the nuts appear to be dominant to white and dependent on different genes.

3932 **Annual Report of the Department of Agriculture, Colony and Protectorate of Kenya for 1956. Volume II—Record of investigations.** 1958 : Pp. 181.

Wheat. Varieties 354, Regent and 321 were attacked by stem rust for the first time; new races of the pathogen have therefore probably arisen. At Njoro, 70 crosses were made, using parents which have exhibited resistance to the newest races of stem rust. Of the 12 varieties released, the following were bred locally: 358AC4A, 358P7C and 358R7E, all derived from 184P2A1E x 294B2A3; 363K1B3 (261S10C2D x Warigo); 362B1A1B and 362B1D3D, both from Equator x 294M7C6C; and 1066/1 and 1066/6, of unknown parentage [cf. 233].

Maize. Progress in developing synthetics at Kitale and Njoro is reported [cf. 1294]. The first synthetic to be released from the Njoro station gave a good performance in neighbouring districts but was disappointing elsewhere. At Njoro the synthetic was superior to mass-selected maize in yield, earliness and uniformity. Lines homozygous for resistance to *Puccinia polysora* have been polycrossed to provide the basis of a first bulk issue. Using local white maize as the recurrent parent, back crossing of the hybrids from which these lines were derived has also been effected. Selfing of the BC_3 is to be undertaken to obtain resistant lines for the production of a stock with more vigour and local adaptability than the earlier one. This breeding is chiefly being carried out with AFRO24 material, containing gene 2 which confers resistance to the two races of *P. polysora* so far found in East Africa.

Grasses. Varieties of molasses grass (*Melinis minutiflora*) or of African foxtail (*Cenchrus ciliaris*) have not cross pollinated when grown in adjacent plots. These species may therefore be autogamous or apomictic. Preliminary observations on Rhodes grass (*Chloris gayana*) suggest that it is allogamous. Flowering in signal grass (*Brachiaria brizantha*) and Rhodes grass was studied to secure information for future application in breeding.

Coffee. Work on varietal resistance to *Hemileia vastatrix* and the distribution of races of the pathogen was initiated.

Pyrethrum. Single-plant selection of hybrids continued and new crosses were effected. Hybrids C35, C51, C60 and C79 maintained their promise in extensive trials. It has again been demonstrated that viable seed can usually be obtained only through cross pollination of different clones. Beetles, flies, bees and possibly thrips are the chief pollen vectors. Selfing occurs only rarely and appears to be confined to certain clones and to be associated with seasonal conditions.

3933 **Annual Report of the Department of Agriculture, Tanganyika, 1956** (1958) : Pt. II : Pp. 106.

Maize. Breeding at Ilonga has been confined to the improvement of the local white variety Katumbili by the Brieger method, with the aim of developing a synthetic.

Sorghum. Breeding early-maturing varieties with high-quality, weevil-resistant grain continued at Ukiriguru. Line 42B (BC27 x Wiru back-cross), with good weevil resistance and equal to SUK1 in grain quality but superior in yield, will probably be issued as SUK2. Lines with grain which may possess some resistance to moulds have been secured from the back cross of BC27 x Msumbiji. The back cross of Dobbs x Wiru has yielded selections with desirable grain characters. Dobbs is being used as a parent because of its *Striga* resistance and high yielding ability. Early-maturing and weevil-resistant lines from crosses of late-maturing varieties having very corneous grains with the early varieties BC27, Dobbs and Oklahoma 44/14 were crossed. The F_1 hybrids are to be intercrossed so that combinations of the type (A x B) x (B x C) are obtained. It is hoped that by intercrossing at this stage selections with both high yield and good grain quality may be developed.

In breeding for resistance to bird attack, promising lines combining good grains, gooseneck (inverted head) and large glumes are expected from the hybrid material in hand. The value of long, strong awns in promoting bird resistance is also being explored. Lines from BC27 x Belko and BC27 x Nandayal Poona are being intercrossed; Belko has long but weak awns and Nandayal Poona stiff awns of medium length. In addition, the possibility of introducing the long, strong awns of *Sorghum purpureosericeum* into cultivated sorghum is being studied.

The attempt to develop *Striga*-resistant lines by selection within Dobbs is continuing.

Two-years' work on colchicine-induced tetraploid material has given encouraging results. The problem of reduced seed set is being tackled by intercrossing and selection for fertility and by using diploid progenitors producing two or more grains per spikelet. The main advantage of tetraploid varieties would be that fertile progeny would be unlikely to result from natural crossing with diploids; they would therefore not be liable to deteriorate through hybridization with local types. Tetraploids may in addition have a wider ecological range, while their larger floral parts may increase bird resistance.

Cotton. [Cf. 3172–3].

Sunflower. West Nile is being inbred and selected at Nachingwea to develop strains with greater self fertility, only white seeds, uniform height and freedom from multiheaded plants. It is planned to produce a nucleus stock of Improved West Nile from S_4 or S_5 lines with the best combining ability, as indicated by a test similar to that suggested by Lonnquist for maize.

Soya bean. The aim of breeding is the production of (1) a nonshattering type for mechanical harvesting, with determinate habit and pods at least 6 in. above the ground, and (2) a nonshattering type for hand harvesting. Crosses effected have consisted mainly of combinations of Hernon 237, Malaya, MIS28EB and Benares on the one hand and R184, Light Speckled and Glycine Ruggett on the other. The first four are tall, long-season, indeterminate varieties and the last three dwarf, short-season types with determinate habit.

3934 HAYLETT, D. G.

Advances in crops and pastures in the Union of South Africa in the last twenty-five years.

Emp. J. exp. Agric. 1956 : **26** : 169–82.

During the period under review, progress made has included the development of hybrid maize and the breeding of improved varieties of sorghum, wheat, lupin, cowpea, soya bean, cotton and tobacco.

3935 **Annual Report of the Department of Agriculture, Nyasaland Protectorate, for the year 1956/7** (1958) : Part 2 : Pp. 142.

The results are briefly reported of trials with sweet potato, cotton, cassava, tobacco, coffee, pome, stone and soft fruits, groundnut, cowpea and soya bean.

Maize. The most advanced group of locally produced inbreds, now at the S_8 generation, are quite uniform. The number of lines in less advanced groups has been reduced by selection, mainly on the basis of susceptibility to *Helminthosporium turcicum* and *Puccinia sorghi*. Further promising collections have been made throughout Nyasaland on the basis of well covered cobs with white, flinty grain. A further synthetic variety is being developed. In single-cross trials R5126 x N2656 had better tip coverage. Other crosses using N2656 also gave excellent results, again emphasizing the value of this inbred. Trials of varieties, synthetics and double-cross hybrids were carried out, keeping quality and regional adaptation being important factors in assessing the results. A number of selections and crosses of local lines and EAAFRO strains were tested under conditions of severe attack by *Puccinia polysora* at Balaka and eleven strains and six crosses were selected which had shown good resistance for two years and had good agronomic characters. At Chitedze 13 strains resistant to *Helminthosporium turcicum*, from Natal, together with 10 local inbreds, were tested for their reaction to this pathogen. Most lines showed excellent resistance and transferring resistance to other lines has begun.

Tea. Progeny from numerous seed sources has been collected and established and selection has begun on the basis of juvenile characters which can be linked with yield, quality and other characters in the mature bush.

Tung. The superiority of budded clonal material over seedlings has again been demonstrated. Yields of clones and stock are tabulated.

Annual Meeting and Convention of the Agricultural Institute of Canada, Acadia University, Wolfville, Nova Scotia, June 23–June 26. Abstracts of papers.

Agric. Inst. Rev. 1958 : **13** : 25–43.

3936 *Bolton, J. L. Forage crop improvement by plant breeding.* (*p. 29*).

A general consideration is given to the aims and techniques of forage-crop breeding.

3937 *Sterling, J. D. E. Barley jointworm on Prince Edward Island.* (*p. 30*).

It is mentioned that hybrid selections showing promise with respect to resistance to jointworm (*Harmolita hordei*) have been developed. These are being further improved in agronomic characters in case this pest again threatens barley production in Prince Edward Island.

3938 *Andrews, J. E. Hardening and selecting for cold resistance in winter wheat.* (*p. 30*).

Experiments on mixtures of four morphologically distinct winter-wheat varieties differing in cold resistance showed that less hardy genotypes may be screened from bulk populations by hardening sprouting seeds for 6 weeks at 0° C. and then freezing at —15° or — 16° C.

3939 *Gfeller, F. An approach to inheritance studies on yield and other quantitative characters in spring wheat.* (*p. 30*).

The Cereal Crops Division, Ottawa, initiated a project in 1949, to determine the inheritance of yield, yield components (number of fertile tillers per unit area, 1000-kernel weight and number of kernels per spike), quality and earliness of heading.

"Instead of studying early generation hybrids in the F_2 and F_3, some 400 to 600 F_2 plants were propagated at random to the F_6 generation, and subsequently the seed of each F_2 descendant line was increased. As sufficient seed became available, some 400 lines were grown in replicated single rod plots." From data on this material and the parents, yield, 1000-kernel weight and number of kernels per spike were found to have a heritability of respectively 64, 45·4 and 35·4%.

3940 *Brawn, R. I. & Henry, V. C. R. A study of the inheritance of earliness in Gaspe flint and some inbred lines of corn.* (*p. 30*).

The maximum heritability of number of days to silking was 26% in the cross between Gaspé Flint and the late-maturing inbred W9 and 79% in the cross of Gaspé Flint with another late-maturing inbred, WF9. The number of genes determining this character was estimated as 29 in the former cross and as 8 in the latter. The relationship in each between observed and theoretical F_2 means was suggestive of geometric gene action. Dominance for earliness was consistently indicated.

3941 *Dore, W. G. Some unusual forms of inflorescence in legumes.* (*p. 31*).

The following abnormalities are considered to be genetic (1) "cauliflower inflorescence," characterized by chlorotic bracts and found in Alsike, sweet clover and *Hedysarum*, and (2) "onion inflorescence" in Alsike and white clover, in which the calyces are distended by included and contorted corollas.

3942 *Dowrick, G. J. The production of mutations in crop plants using radioactive phosphorus.* (*p. 37*).

A report is given of experiments in progress at the John Innes Horticultural Institution, England, to determine the effectiveness of P^{32} as a mutagenic agent, using tomato, apple and *Digitalis purpurea*. [3697].

3943 *Bishop, C. J. The use of radiation as an apple breeding technique.* (*p. 37*).

Work on the induction of mutations in the apple by X rays and thermal neutrons at the Kentville Experimental Station, Nova Scotia, is briefly surveyed. [XXVII, 4310].

3944 *Lapins, K. Progress report on artificial freezing of fruit tree material.* (*p. 38*).

One-year old twigs of 40 apple varieties were subjected to artificial freezing during December, January or February at the Summerland Experimental Station, B.C. The effects were evaluated by (1) estimates of discoloration,

(2) observations on recovery of forced twigs and (3) measurements of electrical conductivity in exosmosis water of frozen twigs. Treatments in December and January gave more reliable results than those in February. If the treatments in February were excluded, the results from the three methods of evaluation were highly correlated. Method (3) registered fine differences between varieties with a low degree of injury, while (2) was valuable in recording severe injury. In comparing the performance of the same varieties in two years, (2) gave more consistent results than (3).

3945 Informe Anual 1956–57. Instituto Interamericano de Ciencias Agrícolas Turrialba Costa Rica. (**Annual Report, 1956–57. Inter-American Institute of Agricultural Sciences, Turrialba, Costa Rica**). Pp. 55.

It is reported that some intervarietal maize crosses developed in Turrialba have outyielded recognized varieties and are more widely adapted.

Among 1100 rice varieties, a number showing good resistance to *Piricularia* and *Cochliobolus* have been found.

The development of productive and disease-resistant varieties of cacao and coffee is in progress.

3946 **Report of the Governing Body and the Principal's Report of the Imperial College of Tropical Agriculture, St. Augustine, Trinidad, for 1956–57** (1958) : Pp. 63.

Cacao. Study of hybrids of ICS clones with SCA6 and SCA12 continued. During 1954–57 the best crosses, ICS6 x SCA6 and ICS6 x SCA12, have produced respectively 4818 and 4774 lb. dry cocoa per acre. Bean size is somewhat small but exceeds the 1 g. dry weight given as a minimum limit by British manufacturers. The SCA12 progenies continue to be more heavily infected with witches' broom than the SCA6 hybrids. Other clones are being crossed with SCA6. It is considered that the SCA hybrids now under observation at River Estate offer possibilities for the isolation of witches'-broom resistant individuals possessing other desirable characters. A small number of trees have been sib-crossed and their progenies are being tested for seedling resistance. In addition, a wide range of crosses has been tested for reaction to seedling inoculation with *Marasmius perniciosus* to obtain further information on the resistance of different types [cf. 4546]. As reported elsewhere [3274], genetical analysis has resulted in the recognition of three main types of self-incompatible tree. Investigations on various progenies raised in the breeding programme have indicated that probably three loci, *A*, *B* and *S*, are involved in the inheritance of incompatibility. The incompatibility reaction controlled by *S* alleles is not expressed except in *AaBb, AABB, AaBB* and *AABb* genotypes. With homozygosity of *A* or *B*, or both loci, for the recessive alleles, the tree is self compatible, even if active *S* alleles are present.

Banana. In breeding to develop ♂ parents, families from crosses between disease-resistant strains of *Musa banksii* recently collected in the Pacific region and edible diploids have been planted in both Trinidad and Jamaica. At Bodles, the chief ♂ parent in use is a triple hybrid between wild strains of banana from Burma and Samoa and an edible diploid, Sikuzani, from Zanzibar. Bunches of this hybrid are heavy, compact and symmetrical. Hybrids of Tongat, an edible diploid from Borneo, with edible diploids show some promise of yielding useful ♂ parents. Tongat is notable for vigour, disease resistance and the high quality of its short fruit. Study of ♀ sterility in edible bananas continued. It has been concluded that bud pollination is unlikely to be useful in breeding except possibly in certain diploid crosses [cf. XXVII, 3846]. Research on the relative importance of pre- and post-fertilization failures in causing seed sterility in edible types was initiated. Further work was carried out on interchanges in *M. acuminata* and interspecific hybridity among other members of the genus.

Other crops. A programme on food crops has been initiated in response to the recommendation of the British Caribbean Advisory Council on Agriculture, Animal Husbandry, Forestry and Fisheries, The first stage entails the survey and collection of varieties of local and foreign origin with a view to their immediate value or use in breeding, classification of the varieties and determination of their chromosome numbers and relationships. The crops under investigation are sweet potato, pigeon pea, yam, maize, cassava and aroids.

Year Book of the Carnegie Institution of Washington 1956–1957 : No. 56 : Pp. 425.

3947 *Smith, J. H. C., Durham, L. J. & Wurster, C. F. An inquiry into the causes of albinism.* (*pp. 279–81*).

An examination of several albino mutants of maize revealed that their leaves failed to become green in continuous illumination because the chlorophyll formed was bleached by light. Investigations on possible causes of the bleaching are reported.

3948 *Clausen, J., Hiesey, W. M. & Nobs, M. A. Contrasting tolerance ranges of apomictic species and hybrids of* Poa. (*pp. 293–96*).

Interspecific hybrids and parental species are under test throughout the USA. A study is also being made of the performance of hybrid lines in Sweden (55–68° N. latitude), Norway and Scotland. The majority of the hybrids were selected in the F_2. In general, it has been found that each hybrid combination constitutes a family of lines which is physiologically distinct, with a characteristic range of tolerance of various conditions, although minor differences between strains from the same cross may be evident. A given genome may be ecologically the more influential in one cross, but when combined with the genome of a different species its effect may no longer be predominant. A species may be unable to survive in some regions but when its genome is combined with that of a second species it may nevertheless contribute the capacity to develop physiologically important properties which render the hybrids able to survive in a much wider range of conditions. The following examples are described. (1) Hybrids of *P. ampla* 'Albion' x *P. pratensis* 'Mather' resemble the former parent in being highly vigorous in the Pacific Northwest but unsuccessful in the eastern part of the USA. (2) In hybrids between the same individual of *P. ampla* as that used in breeding the previous group and *P. pratensis* ssp. *alpigena*, the influence of the latter parent predominates, the hybrids being able to survive in a fairly vigorous condition where those from the first cross failed to grow. The strains have an unusual latitudinal range of survival. Although failing to flower they grow moderately well in Louisiana at 30° N., and attain full development from 34° to 49° N. on the west coast of N. America. In Sweden they are highly successful at 65° N. and in Norway at 61° N. (3) Strains from *P. ampla* 'Kahlotus' x *P. pratensis* 'Athabaska' are among the most successful hybrids in the western and also the central and eastern states, where they surpass Athabaska. The former parent originated from a somewhat lower altitude than Albion while the latter was introduced from central Canada. (4) In its hybrids with *P. pratensis* 'Athabaska', 'Mather' and 'Leevining', *P. scabrella* contributes an ability to flower early and, compared with *P. pratensis*, increased vigour in certain environments and a higher degree of drought resistance. *P. scabrella* itself is however only successful in the Mediterranean type of climate in California.

3949 *Hershey, A. D., Burgi, E., Mandell, J. D. & Tomizawa, J. Growth and inheritance in bacteriophage.* (*pp. 362–64*).

Evidence has been obtained that the "chromosome" of phage T2 contains nucleic acid exclusively and that it can multiply in functional form in bacterial cultures containing chloramphenicol, which inhibits synthesis of all phage proteins.

3950 *Streisinger, G., Martinello, M. & Wassermann, F. Genetic studies with bacteriophage.* (*pp. 364–68*).

Mutations resulting in loss of adsorptive capacity in phage T2*h* take place at any of a large number of sites within the functional genetic unit concerned, but reverse mutations restoring the adsorptive capacity occur precisely at the sites of the corresponding forward mutations. The reverse mutants are however not necessarily identical with the original, unmutated form.

Previous investigations have indicated that the components of the phage particle responsible for the specific adsorption to host cells are produced in a pool. The specificity of the components is determined by the *h* functional unit, but the components become associated more or less at random with phage genetic material during the course of maturation. It has been now demonstrated that at least two components are associated with each phage tail. The attachment specificity of T5 and PB, two related phages which are unrelated to T2, is controlled by a number of independent loci. PB partially excludes T5 in mixed infections. The inheritance of the property of exclusion was shown to be fairly complex.

3951 *Demerec, M.*, et al. *Bacterial genetics.* (*pp. 368–76*).

Studies of genetic processes in *Salmonella typhimurium*, using methods based on the phenomena of transduction and transformation continued. Stocks have been synthesized having various combinations of markers representative of locus *cysB* for cysteine requirement and of loci *tryA*, *tryB*, *tryC* and *tryD* for tryptophane requirement. These five loci are so closely linked that they are carried together in one transducing fragment. Preliminary experiments with such stocks have indicated that three separate portions of a transducing fragment may be incorporated simultaneously into a newly formed bacterial chromosome. If incorporation is accomplished through a process similar to crossing over in higher organisms, six simultaneous crossovers would be required to produce the combinations of markers detected. It appears that the chromosomes of donor bacteria are partitioned during the lytic process into small sections in some regular way and at predetermined sites, uniform transducing fragments thus being produced for any one region of the chromosome.

In another experiment on *Salmonella*, *tryD*-7 cells were combined with DNA extracted from the wild type. A large number of variations carrying both the wild-type allele of *tryD*-7 and a mutation at the very closely linked *tryD* were obtained.

3952 *Käfer, E. Genetics of* Aspergillus. (*pp. 376–78*).

In an analysis of haploidization in *A. nidulans*, aneuploids have been isolated from a diploid strain in which markers on all chromosomes made it possible to determine the number of disomic chromosomes and to detect the breakdown of the unstable aneuploids into haploids. Most haploids arose as a consequence of stepwise loss of one member of the different chromosome pairs. Of the intermediate aneuploid stages, those with a large number of disomic chromosomes were less viable than those possessing only one disomic pair, but even the latter were outgrown when in competition with the derived haploid. The occurrence of seven linkage groups had been demonstrated in previous research at the University of Glasgow, Scotland. An eighth linkage group has since been identified. The finding of eight groups is consistent with recent cytological evidence of eight chromosome pairs at meiosis.

3953 *Kaufmann, B. P.*, et al. *The nature of the materials of heredity.* (*pp. 378–93*).

Using both plants and animal cells, research has been concentrated on structural patterns of chromosomes as revealed by the electron microscope and on the changes affecting these patterns as the result of treating fixed cells with nucleases and proteases having known specificity of action on nucleic acids and proteins. Some of the results support the earlier assumption that chromosomes consist of continuous fibrillar elements composed of protein, to which the nucleic acids are attached laterally. The effects of treating living cells of *Tradescantia* with ribonuclease during meiosis emphasized the significance of RNA in the maintenance of chromosome form and structure. They also suggested the possible role of RNA in crossing over and recombination. The role of intracellular deoxyribonucleases in cell division is another problem receiving attention, but this project is still at the first step, viz. isolation and characterization of the enzymes.

3954 *McClintock, B. Genetic and cytological studies of maize.* (*pp. 393–402*).

The a_1^{m-1}-*Spm* (Suppressor-mutator) system was further studied [cf. XXVII, 139]. Two tests, based on the linkage relation between *Spm* and a marker gene, were carried out to determine the degree of stability of the position of this component. Test (1) involved progeny of a plant carrying a_1^{m-1}/a_1 (chromosome 3), *Wx*/*wx* (chromosomes 9) and one *Spm* component linked with *Wx*. Variegated plants, derived from variegated kernels in the *Wx* class in the first ear of this plant, were tested for the number and situation of *Spm* components, using pollen from plants homozygous for a_1^{m-1} and *wx* and lacking *Spm*. The results indicated that *Spm* frequently underwent change of place in the chromosome complement, losses and increases in the number of this component in different plants and in different parts of the same plant being attributable to transposition which occurred either late in gametogenesis in the parent or at an early stage in the development of the plants constituting its progeny. Test (2) was carried out on the progeny of an individual containing a_1^{m-1}/a_1^{m-1}, *Y*/*y* (chromosome 6) and one *Spm* closely linked with *Y*. In contrast to (1), this test revealed a case in which *Spm* showed a considerable degree of stability in position.

Occasionally a kernel with an aberrant phenotype may be found in an ear of a plant carrying a_1^{m-1} and *Spm*. Instead of many deeply pigmented spots on a colourless background, such a kernel may have only one or a few tiny dots of deep pigmentation on a colourless background. Tests of plants raised from the aberrant kernels and of their progenies have shown that in such cases an *Spm* component is present but its capacity to suppress gene action at a_1^{m-1} and to induce mutation at that locus is much weakened. This type of component has been designated *Spm-w* to distinguish it from the standard type, which for the purpose of convenience in this set of experiments is symbolized as *Spm-s*. *Spm-w* components have been found in several different chromosomes. The case of one *Spm-w* component situated in chromosome 5 and having the same value of recombination with *Pr* and *Spm-s* in the parent plant is described in detail. *Spm-s* is epistatic to this *Spm-w*, both components segregating normally at meiosis. *Spm* components with altered expressions may represent changes in the state of the standard type, comparable with changes in the condition of *Ac*.

In addition, a modifier component which greatly increases the rate of mutation of a_1^{m-1} in the presence of *Spm* and which undergoes transposition in somatic cells has been discovered.

The *Spm* system has also been found to be responsible for the control of gene action at locus a_2^{m-1}. Two different states of a_2^{m-1} were investigated. In the case of one of these states, some gene action occurs at the locus in the absence of *Spm*, resulting in the production of uniformly distributed anthocyanin in both kernel and plant. The rate of action appears however to be lower than that of the standard A_2 gene, since the intensity of pigmentation is less. In the presence of *Spm*, gene action at a_2^{m-1} is suppressed, except in cells in which mutations at this locus, initiated by *Spm*, allow full activity. The mutations result in stability of expression of the genic material at the locus in subsequent cell and plant generations. The characteristics of this state of a_2^{m-1} are thus essentially similar to those of some states of a_1^{m-1}. In the absence of *Spm*, the second state of a_2^{m-1} leads to the production of deeply pigmented kernels and plants although as with the first state, the colour is not so intense as that associated with A_2. When *Spm* is present, both kernel and plant are variegated. Pigmented areas in the kernel have about the same intensity as those produced in absence of *Spm*, but colourless areas may be observed within the pigmented ones. The pattern of variegation in any one kernel depends upon the number of *Spm* components. The type of pigment and the dosage effect of *Spm* on the pattern of the coloured areas suggest that the variegations are not related to mutation at a_2^{m-1}. The pigmented areas appear instead to reflect changes affecting *Spm*, which either result in its removal or alter its capacity to suppress gene action at a_2^{m-1}. *Spm* in the cultures representing the two states of this locus is not the same as *Spm-s* in a_1^{m-1} plants. Changes in its mode of control of gene action at a_2^{m-1} sometimes occur in somatic cells, these changes often being expressed in different sectors of the same plant. The alterations affect both the suppressor and mutator action of *Spm*. The marked difference in stability of action between this *Spm* and *Spm-s* was revealed when the latter was introduced into the a_2^{m-1} genotype. *Spm-s* exerted a stable control over gene action at a_2^{m-1}, of a type similar to that at a_1^{m-1}. The nature of the changes of *Spm* in the a_2^{m-1} genotype is not yet understood. The transpositional behaviour of *Spm* components in a_2^{m-1} and a_1^{m-1} cultures is however similar.

A fragment of chromosome 9, consisting of the distal third of the short arm, was further studied [cf. 146]. The fragment shows highly aberrant behaviour in somatic cells. It may be lost in some cells or undergo changes in structural organization in others. It may also become attached to the ends or centromeres of other chromosomes, or be incorporated in another chromosome. Both the frequency and time of occurrence of the events leading to such consequences are known to be under genetic control. In addition, genetic evidence has been secured indicating that the rules assumed to apply to crossing over in maize are not necessarily followed by the fragment when it participates in crossing over.

3955 **Agricultural research in review. Sixty-ninth Annual Report 1955–1956.**
Bull. Md. agric. Exp. Sta. 1957 : No. A-87 : Pp. 81.

Cereals. Breeding for mildew resistance in wheat and barley and the mode of inheritance of this character are receiving attention.

Several hybrids of maize involving the single cross WF9 x 51A in their parentage showed a high degree of drought tolerance.

Losses of parts of the chromosomes induced by X ray treatment of maize pollen were associated with the formation of extra embryos. Chromosome pairing was abnormal in the PMCs of plants derived from a set of twins.

Cocksfoot. Progress has been made in developing late-maturing strains to be grown with lucerne for hay.

Clovers. Breeding is under way to combine the desirable features of local strains of red clover with the resistance to southern anthracnose and the marked expression of the perennial habit found in other lines. Improvement of Ladino clover with respect to persistence, drought resistance and competitive ability against tall grasses is under way.

Sweet potato. Newer varieties such as Goldrush, Sunnyside and Kandee, as well as some experimental selections, showed little or none of the oxidase activity causing darkening after peeling for canning.

Sweet pepper. Two lines derived from twin seedlings induced by X-ray treatment of the pollen have exhibited promise in fruit quality.
Tobacco. Breeding for resistance to black root rot, mosaic, wild fire, black shank, bacterial wilt and anthracnose continued. A black-shank resistant selection has given good results during the past three seasons. Equal in quality and weight to the best standard varieties in Maryland, it has a slightly higher content of total alkaloids than Catterton and Robinson. An unspecified source of aphid immunity has been discovered among *Nicotiana* spp. An attempt to introduce the immunity into Robinson has been initiated.

3956 **69th Annual Report of the South Carolina Agricultural Experiment Station 1957** : Pp. 58.

Wheat. One line, Gabo x Kenya/Urquiza from Mexico, out of 110 tested, showed less than 5% infection after artificial inoculation with *Ustilago tritici* and three out of 175 were immune to *Septoria*. Out of 65 tested for resistance to *Puccinia rubigo-vera* var. *tritici* 13 showed a useful degree of resistance.
Oats. Testing for resistance to soil-borne mosaic and a combination of loose and covered smuts showed 20 out of 1130 lines resistant to the first and 15 out of 220 to the second.
Barley. Of 1040 lines tested six were resistant to *Ustilago nuda*, *Helminthosporium sativum* (*Cochliobolus sativus*) and *Rhyncosporium secalis*, 36 to both spot blotch and scald and 66 to loose smut.
Bermuda grass. The release of Sunturf is noted [XXVI, 3393] and its performance described.
Lucerne. Selection since 1932 in Kansas Common, at the Sandhill Station, has improved its adaptation, resulting in increased yields.
Sweet potato. Tests with more than 100 isolates of *Fusarium oxysporum* have shown the presence of two races, race 1 being generally more virulent than race 2. Differences in pathogenicity have been found between isolates within the two races.
Cotton. Progress has been made in the development of an Upland strain with fibres 1¼ in. long and high spinning performance. In spinning tests hybrid 330 has given results as good as those from Egyptian Karnak although its boll size is poor. A recent segregate from this line produces larger bolls with a higher lint percentage.
Cucumber. Ashley and Stono show good field tolerance of *Erysiphe cichoracearum* while the breeding line SC50 is highly resistant although not of high enough quality in other respects to warrant its release.

3957 **70th Annual Report of the Mississippi Agricultural Experiment Station for the fiscal year ending June 30, 1957** : Pp. 93.

Wheat. New races of rust attacking most commercial varieties have arisen. Addition of genes for resistance to Chancellor, Taylor and Coastal is one of the ways in which the problem is being tackled.
Oats. The Victoria-blight resistant variety Mid-South was released [XXVII, 3965].
Rye. Strains developed in Mississippi led in average grain production when tested in the south-eastern states. Rye is being further improved by shortening the straw and changing seed colour to a uniform light brown.
Maize. Experimental yellow and white double crosses surpassed commercial hybrids in yield and percentage of erect stalks at harvest. Of the 250 inbreds tested for reaction to brown spot (*Physoderma maydis*), 25 were highly resistant. Some inbreds were not however good as parents in transmitting resistance. Dixie 29, Dixie 55 and Pfister PAG631 were the commercial hybrids showing most resistance to brown spot.
Sorghum. Hybrids generally outyielded the better varieties. Lines are being selected for lax head, yellow endosperm, disease resistance and early maturity.
Grasses. Variation has been induced in Dallis grass (*Paspalum dilatatum*) by treating the seeds with X rays or thermal neutrons.
In ryegrass, four cycles of selection by means of artificial inoculation have raised crown-rust resistance to an average of 94%. Further selection is being made for resistance to *Helminthosporium*.
A persistent, high-yielding and self-fertile selection of Johnson grass (*Andropogon halepense*) is to be released. Hybrids between Johnson grass and sorgo or grain sorghum are under investigation. The protein content of silage from two segregates of Johnson grass x durra was 60% higher than that of silage from sorgo.
Single crosses are being made in the field between three stem-rust resistant lines of cocksfoot.
Forage legumes. Chief, a crimson-clover selection, is to be distributed.
A new variety of red clover resistant to powdery mildew has equalled Kenland in hay yield.
Seed of Alsike clover, crimson clover and

Lespedeza cuneata was treated with neutrons and γ rays in the hope of inducing disease-resistant mutants.

Sweet potato. Progress has been made in breeding for yield, some seedlings giving more than 500 bushels per acre. Oklahoma parents possessing resistance to wilt and nematodes were crossed with others having desirable horticultural characters.

Cotton. Strains with less than 0·1% gossypol content have been discovered.

The high degree of resistance of Egyptian cotton to *Fusarium* wilt is being transferred to susceptible strains of Upland. The Upland type of resistance to this wilt is also being incorporated in susceptible strains. In addition, the high degree of tolerance of Egyptian cotton to *Verticillium* wilt is being imparted to Upland. At the Delta Branch Station study of the relationship between lint length and percentage indicated that inheritance of these characters is due to additive and dominant genes, with very little effect from nonallelic interaction. Other genetical investigations dealt with red plant colour, hairiness, small bracts and parent-progeny correlations. Work was continued on the transfer of characters to doubled haploids, with emphasis on genome D_2. Smooth-leaved strains with high yield and acceptable fibre properties are under multiplication for possible release.

Sweet pepper. Inheritance of the resistance to *Cercospora* blight found in a wild type depended upon three or more genes. For practical purposes it may however be possible to transfer sufficient resistance to commercial varieties.

Fruits. Breeding of tree and small fruits is in progress.

Cucurbits. Cucumber selections from crosses involving an introduction from India have exhibited the highest degree of downy-mildew resistance.

The cantaloupe Homegarden was released [XXVI, 3883].

A new variety of water melon, resistant to *Fusarium* wilt, is undergoing test prior to its release. It is of the Florida Giant or Black Diamond type but much better in quality.

Tomato. Lines homozygous for resistance to *Fusarium* wilt have been secured from back crosses of Gulf States Market x Southland to Southland. Selections from Hawaii have shown heritable resistance to the four root-knot nematodes of common occurrence in the state.

Bean. Seed of the pole snap-bean Blue Lake has been irradiated with neutrons in an attempt to induce a bush type retaining the canning quality of this variety.

Cowpea. Two genes were found to control the resistance of Iron to each race of *Fusarium* wilt. This resistance is being incorporated in Crowder, Purple Hull, Blackeye and Cream types.

Pea. The attempt to obtain mutants resistant to *Ascochyta* blight by X irradiation has so far been unsuccessful.

Sweet corn. Selections are being top-crossed with Golden Security.

3958 **Annual Report of the University of Wisconsin Agricultural Experiment Station Part II.**
What's New Fm. Sci. 1957 : Bull. No. 527 : Pp. 104.

Cereals. The soft red winter wheat Racine was released [XXVII, 1570]. Oat varieties and selections were evaluated for resistance to *Leptosphaeria*. Resistant selections frequently included Clinton, Vicland and derivatives of Victoria-Richland and Hawkeye-Victoria in their parentages.

The maize hybrids W563 and W690, taking 110 and 120 days respectively to reach maturity, were released. W690 is recommended as a silage type for the southern part of the state. Maize strains of diverse geographical origin are being tested for rust resistance. The Peruvian variety Cuzco has resisted all isolates.

Tobacco. The mosaic-resistant binder type of cigar tobacco, Havana 425, has been developed [cf. 2001].

Onion. The hybrids Golden Beauty and Bronze Perfection, both globe types, were released.

Tomato. The early variety Wisconsin Chief has been developed from Victor x Long Red. Its large, smooth fruits resist cracking and sun burning.

Pea. The new canning peas New Wales and New Season are resistant to wilt, near wilt and bean virus 2. They require about 69 and 61 days respectively to reach maturity. New Wales produces large oval peas, one of its ancestors being Perfected Wales. New Season (Loyalty x Delwiche Commando) bears small round peas. Both varieties are short haulmed.

Sweet corn. Wisconsin 909, a hybrid with attractive ears and well-filled tips, was released. Ripening about five days earlier than Golden Cross Bantam, it is regarded as promising for both the fresh market and canning.

3959 **Agricultural research in South Dakota. Seventieth Annual Report of the South Dakota Agricultural Experiment Station, July 1, 1956 to June 30, 1957.** Pp. 54.

Brief accounts are presented of progress made in breeding wheat, oats, maize, barley, rye, sorghum, forage grasses and legumes, flax, sunflower, castor oil plant, safflower, apple, pear, apricot, raspberry, grape, forest trees, tomato and soya bean. Special mention is made of studies in progress on the genetics of the reaction of lucerne to the black-stem disease complex and some flax selections resistant to *Mycosphaerella linorum* were crossed with Marine and Redwing in order to transfer the resistance to accepted varieties.

Estado actual de los trabajos de experimentación e investigación agrícola que realiza la Estación Experimental Agrícola de la Asociación de Agricultores de Cañete y resultados prácticos obtenidos en beneficio de la agricultura del valle. (Mayo de 1949 a Febrero de 1958). [**The present state of the experimental and agricultural research work being carried out by the Agricultural Experimental Station of the Farmers' Association of Cañete and the practical results obtained for the benefit of agriculture in the valley.** (**May 1949 to February 1958**)] : Pp. 48. (Mimeographed).

3960 *Boza Barducci, T. Experimentos de selección genética del algodón y de otros cultivos.* (*Work on the genetical selection of cotton and other crops*). (*pp. 3–13*).

Maize. Top crosses Cañete 1 (Arizona blanco [Arizona White] x LM4) and Cañete 2 (Colombiano Fumagalli x LM4) have been released and new top crosses of lines LM4 and 135 with Selección Amarillo Cañete 1 [Cañete Yellow Selection 1] and Colombiano Fumagalli are being studied.

Potato. A hybrid from a cross between Huasahuasi and Ticanel, the latter derived from *Solanum tuberosum* x *S. demissum*, shows promise in respect of productivity and blight resistance.

Sweet potato. Among new clones of Paramonguino, clone 9 is interesting on account of its superior productivity and canning and eating quality.

Cotton. The performance of productive Tangüis varieties developed since 1949 is described [cf. XXV, 2199 and XXVIII, 733]. The early *Gossypium hirsutum* varieties Acala and King have been crossed and back crossed to either pubescent Tangüis types resistant to aphids or to Tangüis forms with cleistogamic flowers affording resistance to an insect referred to as *Pococera* and other insect pests. Egyptian cottons such as Karnak (Giza 29) and large-bolled Colombian cottons have been crossed.

The hybrid *G. hirsutum* 'U4' ($n = 26$) x *G. raimondii* ($n = 13$) was at first sterile but after open pollination gave rise to some fertile bolls from which the very early lines Cñ-H-222 and Cñ-H-223 have been developed. The latter have the following characteristics: almost sympodial plant type, with only 1–2 vegetative branches, sometimes none; erect stem; short internodes; fruiting branches with 5–7 bolls of medium size (3·09 g.); white fibre similar to that of Tangüis; staple length 29·2–30·3 mm.; and fibre percentage 36·7 (slightly less in Cñ-H-223). They are adapted to the soils of the Pampa de Imperial and the San Benito series. Data on the technological properties of these varieties are included. Work on the improvement of their earliness, boll size, wilt resistance and insect resistance is now in progress.

Breeding for resistance to *Verticillium albo-atrum* was begun in 1951. Type X and biotypes A and B have been found at Cañete. Most of the resistant lines being studied derive from LMW 12–40.

Selection for resistance to nematode and the nematode-wilt complex is also under way.

Phaseolus. Selection and multiplication of varieties continued.

3961 *del Carpio Burga, R. Experimentos agronómicos sobre algodón y otros cultivos.* (*Agronomic experiments with cotton and other crops*). (*pp. 14–23*).

On the basis of trial results, recommendations for cultivation in Cañete are made. In addition to varieties and hybrids noted earlier [XXV, 2199, XXVIII, 733 and 3960], mention is made of the yellow dent maize Cuban Yellow Dent PD (Ms)4 x PF(Ms)4, which has given good yields; the sweet potato Seedling 50, combining the high quality and yield of its parent Paramonguino with high nematode resistance; the productive bean Canario Selección Cañete 1950; the sugar cane CH-37, which combines good yield with resistance to *Diatraea*; the high-yielding melon PMRC45, resistant to mildew and high in quality; and the castor oil variety Baker Hybrid 25.

3962 Ministerio de Agricultura Oficina de Investigaciones Especiales. Sexto Informe Anual, Mayo 1°. de 1955 a Mayo 1°. de 1956. (**Ministry of Agriculture Bureau of Special Studies. Sixth Annual Report, 1 May 1955 to 1 May 1956**).
Rev. nac. Agric., Bogotá 1957 : **51** : 1–89.

Wheat. Among new varieties, Andes, from the cross II–947–7b–1b–3r Kentana-Frontana x Mayo 48, has proved particularly promising in respect of milling and bread-making quality. Also promising are lines from the crosses II–2809 Frocor x Yaqui-Kentana and II–2463 Frocor x Kentana, which are early and good in quality. To obtain a wide basis for resistance to rust races, a programme of breeding synthetic varieties has been initiated, 127 varieties of *Triticum vulgare* and 30 of *T. durum* being used as nonrecurrent parents. Crosses have been effected with the aim of transferring the Canadian type of stem-rust resistance to the good variety Sunland.

Maize. Inbred lines of numerous varieties are being developed at Medellín, Montería, Palmira and Bogotá. At Montería, selection for resistance to rust and *Helminthosporium* is receiving special attention. Crosses between Venezuela Puya Grande and local Montería varieties appear very promising in respect of ear length and grain. Numerous test crosses, single crosses and double crosses have been studied. Other work includes the development of synthetic varieties and the transference of the ear-rot resistance of yellow varieties to white varieties and of male sterility to suitable female parents. Lines from Colombia 2 and Eto always show marked resistance to *Fusarium* and *Diplodia* stalk rots; other resistant lines have also been found. Material showing resistance to *Diatraea* attack has been selected.

Barley. Numerous crosses have been effected with the aim of incorporating disease resistance from various sources into varieties good in quality and yield. Among the most productive lines are 30, Funza x Tchechostor 929, II–211–10b–10b–(1–14)b and sister selections. The first-mentioned is early, adaptable and highly resistant to lodging, even at high levels of fertilizer application; its malting quality was better than that of commercial barley but was surpassed by that of Funza and other crosses.

Forage crops. In the collection of ryegrass at Tibaitatá, three high-yielding strains with some resistance to rusts have been found. White clover clones are being developed with a view to producing synthetic varieties. Peruvian and Chilean lucerne selections are notable for their high forage yield.

Potato. Clones with one or more of the following characteristics have been selected for use as parents: high yield, early maturity, resistance to blight, resistance to frost, high cooking quality and attractive tuber shape. Eight hybrids which outyield the common varieties Tocana Blanca [White Tocana] and Tuquerreña are being multiplied. Ten races of *Phytophthora infestans* have been identified.

Phaseolus. At Palmira, a line from Estrada Rosado x Liborino, named Diacol Maravilla [Diacol Marvel], has proved resistant to *Isariopsis griseola* [cf. **1364**]. Efforts to introduce resistance into the high-yielding variety Algarrobo from México 487 or Huila 14 are in progress. At Medellín, selection for growth habit and tolerance of excessive humidity has been effected in a cross between Liborino, which is resistant to root rot in wet soils, and the high-yielding variety México 11, which has small black seeds; seeds of the best lines are yellow with dark red stripes like those of Liborino and are intermediate between those of the parents in size. The variety Estrada Rosado was found to contain round-seeded and long-seeded forms, plants from the former proving highly susceptible to rust and those from the latter extremely resistant. In crosses between widely different parents, mass selection was very much less effective than pedigree selection. Algarrobo and Liborino, both of which had appeared almost immune from anthracnose, have been severely attacked at Bogotá. Huila 14 has proved resistant to both *Colletotrichum* and *Isariopsis*. Sánchez has shown good resistance to anthracnose and is well adapted to conditions at Bogotá; it is undergoing selection for tall stems to obtain material suited to mechanical harvesting. Studies of a number of crosses indicate that resistance to *Isariopsis griseola* is recessive and conditioned by three gene pairs. Little resistance to *Empoasca* has been found.

Cowpea. Two varieties have been selected in Montería, one, Venezuela 10, with a high yield of foliage for green manuring, the other, EE.UU.62 [US62], with seeds of attractive colour for local consumption.

3963 TSCHERMAK-SEYSENEGG, E. VON
Franz Frimmel von Traisenau. Nachruf. (**Franz Frimmel von Traisenau. Obituary**).
Gartenbauwiss. 1958 : **23** : 3–8.

SÍTAŘ, J.
Nachruf für Professor Dr. Franz Frimmel. (**Obituary notice of Dr. Franz Frimmel**).
Züchter 1958 : **28** : 97–99.

Nachruf Franz Frimmel von Traisenau. (**Obituary notice: Franz Frimmel von Traisenau**).
Z. Pflanzenz. 1958 : **39** : 121–26.

Some account is given of the work of the above plant breeder who worked on rye, maize, tomato, tobacco and several other important fruits and vegetables.

3964 A. R. Zwaan 70 Jahre. (**A. R. Zwaan: 70 years**).
Saatgutwirtschaft 1958 : **10** : p. 144.

On the occasion of his seventieth birthday, mention is made of some of the achievements of this Netherlands plant breeder.

3965 PIROVANO, A.
Barriere superate nella ibridazione interspecifica. (**Barriers surmounted in interspecific hybridization**).
Riv. Ortoflorofruttic. ital. 1958 : **83** : 121–26.

Several hybrids of plum x peach are referred to, almost all of them resembling the peach in fruit form. By treatment with radium radiations the author produced one such hybrid in which the fruits were like plums, the flesh being intermediate in type; the fruits remained attached to the tree when ripe however, cracked badly and were sterile.
By moistening the stigma of the seed parent with nectar from the flower to be pollinated it has been possible to obtain sets in interspecific *Cucurbita* crosses; the seedlings were mostly matroclinous haploids but true hybrids were obtained in certain crosses of *C. pepo* x *C. maxima* and *C. maxima* x *C. moschata*, in which the pollen had been treated in an electromagnetic field; these hybrids gave a wide range of types in the F_2, most of them resembling *C. pepo*, however, more than the pollen parent. Certain forms that appeared in the cross *C. pepo* x *C. maxima* contained colocynthin, a glycoside otherwise found only in *Cucumis* (*Citrullus*) *colocynthis*, and others were warty, resembling *Cucurbita verrucosa*.

3966 CICIN, N. V.
(**The importance of distant hybridization in breeding plants and animals**).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 409–22. [Russian].

Mention is made of improved varieties of field crops, industrial and horticultural plants and forest trees obtained by wide hybridization in the Soviet Union in recent years. Among the results mentioned are the writer's own *Triticum-Agropyron* hybrids 1, 189, and 599 [cf. XXIV, 199].

3967 BRADSHAW, A. D.
Phenotypic flexibility in plants.
Heredity 1958 : **12** : p. 143. (Abst).

"Phenotypic flexibility, i.e. the ability of a genotype to vary its expression in different environments, is a character of considerable adaptive significance in most plants. Cultivation of natural populations of the grass, *Agrostis tenuis*, shows that the adaptive changes in morphology caused by the environment are often twice or three times as great as those caused by the genotype. Phenotypic flexibility must therefore be considered to be as significant an attribute of plants as any other character.
"A brief survey of related plant species shows that they may differ very greatly in their phenotypic flexibility. There is some evidence that the same is true of different populations within one species. Phenotypic flexibility must therefore be a character with an ordinary genetic basis. Its occurrence in species and in populations will be under the control of the normal processes of natural selection".

Proceedings of Ninth Oak Ridge Regional Symposium "Radiation in Plant Breeding", sponsored by the University of Tennessee in cooperation with the Oak Ridge Institute of Nuclear Studies, January 14–16, 1957: Pp. 67.

3968 *Ewing, J. A. Origins of the cooperative plant and seed irradiation project at UT–AEC.* (*pp. 1–4*).

A short account is given of the project on plant and seed irradiation recently initiated at Oak Ridge by the University of Tennessee and US Atomic Energy Commission. The objectives are provision of irradiation facilities for breeders in the southern states and development of techniques of treatment.

3969 *Osborne, T. S. Past, present and potential uses of radiation in southern plant breeding. (pp. 5–10).*

General comments are made on the achievements and possibilities of inducing genic and chromosomal changes in crop improvement. The most rewarding use, it is suggested, may turn out to be not the production of gene mutation but in causing chromosomal rearrangements so as to break close linkages, to transfer genes in hybrids of distantly related species, and to induce heterosis associated with structural heterozygosity. The long-lived perennial offers the most suitable material for the attempt to induce heterosis, by X-irradiating the pollen before hybridization and selecting for heterozygotes only in the X_2 generation.

3970 *Shapiro, S. & Sagawa, Y. The Brookhaven cooperative program for radiation mutation research. (pp. 11–35).*

This is a revised and expanded version of the paper read at the Brookhaven Work Conference in 1956 [2693].

3971 *Gregory, W. C. Progress in establishing the effectiveness of radiation in breeding peanuts. (pp. 36–48).*

"The nature of the action of radiations in the production of agronomically desirable alterations in the genotypes of peanuts has not been ascertained. But the breeding behaviour of the radiation-altered genotypes thus far investigated indicates that nearly all vital morphological mutants are recessive or *quasi*-recessive in nature. The widespread occurrence of grades of expressivity in the morphological mutants and the development of graded series in reirradiated mutants of originally constant expressivity suggest nonallelic modifying effects, possibly in the same linkage groups, as a rational explanation for the results obtained in the quantitatively inherited characteristic of yield of dried fruits. If these modifying effects result from unique gene interactions then the genome may be represented as a 'kaleidoscope' which with each new shake-up presents a unique pictorial pattern to be tested on its own merits and which would be destroyed with outcrossing. If, on the other hand, the heterosis in yield, obtained when superior mutants are hybridized, results from the additive effects of blocks of different within-block interactions suggested by the absence of dominance in, and by the graded expression of the visible changes observed, then an additional means of variety building has been attained in the breeding of self-fertilizing species."

3972 *Singleton, W. R. Gamma radiation of growing plants for mutation induction. (pp. 49–57).*

A survey is given of research carried out at the Brookhaven National Laboratory, New York, on the induction of endosperm and other mutations in maize by treatment of the pollen and on the induction of somatic mutation in the carnation. Facilities available for treating plants at the Blandy Experimental Farm, University of Virginia, are also described [cf. XXV, 1049, XXVIII, 1345 and 1398].

3973 *Smith, H. H. An evaluation of the potential of radiation in plant improvement. (p. 58).*

The text of this contribution is not given here but has been published in full elsewhere [2691].

3974 *Conger, A. D. Some cytogenetic aspects of the effects of plant irradiations. (pp. 59–62),*

Cytogenetical aspects of the problem of the survival of induced mutations until they are incorporated in the gametes or bud meristems are discussed in a general way. It is pointed out *inter alia* that the binucleate type of pollen grain should receive considerably smaller doses than the trinucleate since it is likely to be more radiosensitive on account of the additional division it undergoes in the pollen tube before fertilization.

3975 *Singleton, W. R. Summary remarks. (pp. 63–67).*

Among the points made are the following. (1) For seed irradiation, use of self-pollinating plants producing a spreading type of growth is regarded as likely to give the best results. (2) The greater use of ultraviolet radiation is advocated, particularly in grasses in which the pollen grains are small or pollen production is abundant. (3) Induction of self fertility in self-sterile fruits is being attempted by exposing the trees in the radiation field at the Blandy Experimental Farm, Va. (4) From his own investigations the author concludes that it is better to expose plants to a fairly high level of radiation for a short time instead of leaving them in the field for chronic irradiation during their entire life. (5) The radiation technique should be applied in forest-tree breeding. A small-scale project has been initiated at the Blandy Farm to discover whether it is possible to induce blight-resistant mutants of the American chestnut.

3976 Broertjes, C.
Het verkrijgen van mutaties door ioniserende stralen. **(The induction of mutations by ionizing rays).**
Landbouwk. Tijdschr. Wageningen 1958 : **70** : 303–12.

The topics briefly surveyed in this review are (1) types of spontaneous mutations, (2) ionizing radiations and their method of action, (3) rates of mortality and mutation induced by different types of radiation in different crop plants and the effects of varying factors, (4) types of mutation obtained, (5) chemically induced mutation and (6) some practical results attained.

3977 Demmler, R.
Vergleich der Primärwirkungen von Radiomimetika und ionisierenden Strahlen. **(Comparison of primary effects of radiomimetic substances and ionizing radiation).**
Strahlentherapie 1957 : **103** : 695–713.

From a survey of the literature it was not possible to discover the exact nature of the primary effects of radiomimetic substances on living cells; it is thought that these effects must be different from those of ionizing rays although the secondary effects such as mutation may be similar. It was suggested that the term "cytotoxicum" be used instead of "radiomimeticum".

3978 Jur'ev, V. Ja. & Kučumov, P. V.
(The basic theoretical concepts in Soviet breeding and seed production).
Selekcija i Semenovodstvo (Breeding and Seed-growing) 1957 : No. 6 : 8–14. [Russian].

An historical outline of Soviet plant breeding and Mičurinism, with an emphasis on methods employed, is given. Inbreeding, the use of polyploidy and the induction of mutations are now accepted methods. Wheat, maize, flax, hemp, sugar beet, sunflower, kok saghyz and citrus fruits are among the plants referred to in the article.

3979 Dolgušin, D. A., Berčenko, B. Ė. & Fastovec, S. N.
(In the service of industry).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 15–24. [Russian].

Breeding work at Odessa, based on Mičurin-Lysenko genetics, and with various plants including wheat, maize and barley, is discussed.

3980 Chinoy, J. J.
(The effect of Soviet scientific thought upon agrobiological investigations in India).
Agrobiologija (Agrobiology) 1957 : No. 5 : 132–42. [Russian].

Indian research in plant genetics, evolutionary physiology and drought resistance of cereals carried out along Mičurinist lines in the last 25 years is reviewed.

3981 Aufgaben der Pflanzenzüchtung. **(Tasks of plant breeding).**
Saatgutwirtschaft 1958 : **10** : No. 3 : Beil.; Samenfachmann 1958 : No. 5 : 33–40.

Selection procedures in general use are described.

3982 Pruckova, M. G.
(A wealth of wheat varieties created in the USSR).
Agrobiologija (Agrobiology) 1957 : No. 5 : 18–29. [Russian].

The wheat stocks of the USSR, including many recent standards of winter and spring wheats for the principal wheat-growing areas, are described. The new standards outyield the older varieties by 1·5–5·0 c. per ha., have good baking and milling properties and show improvements in hardiness and resistance to pests and diseases. Most of the new varieties, for instance the winter wheats Skorospelka 3 [Early 3], Bezostaja 4 [Awnless 4] and Belaja Cerkov' 198 have been referred to previously [cf. XXVII, 2727]. Worth mention are two new drought-resistant hard wheats from Krasnyj Kut, Melanopus 26 and Krasnokutka [wheat from Krasnyj Kut]. These have vitreous grain rich in protein and are as suitable for macaroni as Melanopus 69, Hordeiforme 432, Hordeiforme 189 and Melanopus 1932.

3983 Korte beschrijving van de nieuwe rassen, welke in 1958 op de interprovinciale proefvelden worden beproefd en niet voorkomen in de 33ste beschrijvende rassenlijst voor landbouwgewassen 1958. **(Short description of the new varieties which were tested in 1958 in the interprovincial trial fields and did not appear in the 33rd descriptive variety list for agricultural crops, 1958).**
Meded. Ned. Alg. Keuringsdienst Landbouwzaden Aardappelpootgoed 1958 : **14** : 131–33.

Information on parentage and agronomic characters is presented for varieties of spring and winter cereals, rape, caraway, pea, dwarf bean, flax and potato, not described in the 33rd varietal list [3574].

3984 Stubbe, H.
Sinn und Bedeutung der Kulturpflanzenforschung. (**The meaning and importance of research on cultivated plants**).
Vortr. dtsch. Akad. Wiss. 1957 : No. 62 : Pp. 21.

In a lecture to the German Academy of Sciences in Berlin the speaker emphasized the importance of a study of the centres of diversity of cultivated plants as sources both of plant-breeding material and of information on the origin of the species concerned, pointing to the difficulty in distinguishing for some plants between the centre of origin and secondary centres of diversity resulting from human intervention. Thus only by the study of more extensive material will it be possible finally to decide on the primary centre of origin of the cultivated wheat species. The production of the entire range of variation in cultivated barley by irradiation has led to the conclusion that mutation must have been one of the prime factors in the evolution of the species. The role of hybridization and polyploidy is illustrated by *Nicotiana tabacum*, *Brassica napus* and the domestic potato. Data are cited in support of the view that maize arose in Central America, though it is left undecided whether the primary centre of diversity is in Mexico or Peru.

The conversion of a wild plant to a cultivated plant by deliberate breeding is illustrated by the production of sweet lupins in Germany and of *Penicillium* mutants with increased yields of penicillin in the USA. The role which these and other developments in agricultural science can play in combating malnutrition is explained.

3985 Kiss, Á.
A citogenetikai kutatások mai helyzete. (**The present position of cytogenetic research**).
Növénytermelés 1957 : **6** : 373–78.

A survey is presented of aneuploidy and polyploidy, with particular reference to the work of Levan on sugar beet and of Sears on wheat. Hungarian breeders are urged to work along the same lines.

3986 Schuphan, W. & Postel, W.
Ertrag und Qualität im Spiegel der Biologischen Wertigkeit der Eiweissstoffe. (**Yield and quality as reflected in the biological value of the proteins**).
Landw. Forsch. 1958 : 11. Sonderheft : 85–101.

After considering what is meant by "yield" and "quality", the authors survey studies which have shown that breeding for increased yield may be accompanied by a decrease in the biological value of the protein produced as has occurred in the case of cabbage and wheat. Other investigations on the effects of fertilizer treatments and other environmental factors on protein quality are also considered.

3987 Stubbe, H.
Bericht über eine biologische Forschungsreise nach Nord- und Nordostchina. (**Report on a biological expedition in northern and north-eastern China**).
Wiss. Ann. 1957 : **6** : 361–72.

In describing the collecting expedition carried out jointly by the Academies of Science of China and Eastern Germany in 1956, mention is made of some of the promising material collected. This includes soya beans with **4** seeds per pod, which may make it possible to breed soya beans capable of giving satisfactory yields in Germany; a great variety of forms of *Brassica pekinensis* was also found. Collections were made of some 3000 wild species which have been incorporated in the world collection at Gatersleben.

3988 Focke, R.
Über die Leistungsfähigkeit von Genotypen im Reinanbau und in Populationen. (**On the productivity of genotypes in pure stands and in populations**).
Züchter 1958 : **28** : 146–49.

With reference to recent literature and his own studies on *Antirrhinum majus* the author considers how the productivity of genotypes may vary according to whether they are grown separately or in mixed populations; in the latter case, marked increases in yield have been found. There is no reliable relationship between the yielding capacity of a genotype in a pure and a mixed culture. The effect of a mixed culture on yield is designated the "divergence effect". When selecting plants for hybridization, it may be useful to make a preliminary determination of the divergence effect; those genotypes which harmonized well would show a good increase in yield when grown together. Also it is important, when testing pure lines, not to have the individual plots so small that the conditions approach those of a mixed culture and the different genotypes may influence one another.

3989 Kiss, Á.
Observations concerning the correlation of disease resistance and polyploidy.
Acta agron., Budapest 1958 : **7** : 379–85.

Studies of resistance to rusts and mildew in diploids and colchicine-induced polyploids are reported.

In the rye varieties Magyaróvár and Kisvárda no differences in reaction could be established between diploid and tetraploid forms.

In wheat, the resistance of *Triticum timopheevi* ($4x = 28$) to mildew and leaf and stem rust was maintained in its amphidiploid ($8x = 56$) with *T. durum* ($4x = 28$), although individual plants showed severe infection. Of three amphidiploid stocks ($10x = 70$) of the susceptible *T. aestivum* ($6x = 42$) with *T. timopheevi*, all were immune from mildew, one was resistant to both rusts and the others showed varying degrees of susceptibility to the rusts. F_1 hybrids from *T. turgidum* ($4x = 28$) x *Secale cereale* 'Óvár' ($2x = 14$), *T. aestivum* 'B1201' ($6x = 42$) x *S. cereale* 'Óvár' and *T. aestivum* 'F481' ($6x = 42$) x *S. cereale* 'Óvár', the first with $3x = 21$ and the two latter with $4x = 28$, were resistant to all three diseases as were also their respective amphidiploids, although all the parents involved were highly susceptible. Some susceptible F_1 individuals were also obtained, but the production of amphidiploids from them did not succeed.

In lucerne, the local race Gyula and the Martonvásár strains BO10 and 091–18, all with $4x = 32$, were more resistant to mildew and rust than the corresponding forms with $8x = 64$.

3990 KRUG, H.
Photoperiodische Forschung und praktischer Pflanzenbau. (**Photoperiodic research and practical plant cultivation**).
Beitr. Biol. Pfl. 1958 : **34** : 267–91.

In reviewing studies on photoperiodism with special reference to crop plants, a brief mention is made of the importance of this work in relation to plant breeding and introduction.

3991 BRIAN, P. W.
Reversal of genetic dwarfism in plants by gibberellic acid.
Heredity 1958 : **12** : 143–44.

Evidence in favour of two suggestions explaining this phenomenon is discussed, firstly that genetically dwarf plants are characterized by a defect in the metabolism of a gibberellic acid - like hormone, or secondly that gibberellic acid may act by masking or reversing the effects of some growth inhibiting system.

CEREALS

3992 **Cereal news from other countries.**
Cereal News 1958 : **3** : No. 4 : 29–35.

The release is noted of La Porte wheat [XXVII, 1505], Indio [XXVIII, 355], Mid-South [XXVII, 3975], Burnett [XXVII, 1661] and Newton oats [XXVI, 2254 and 3213] and of Traill barley [XXVI, 3305 and 3307]. Mention is also made of the proposed release by the Minnesota Agricultural Experiment Station of the flax selection CI 1658 (Crystal x Redson) under the name Arny.

3993 PRIEN, H. G.
Wo stehen wir in der Getreidezüchtung? (**Where do we stand in cereal breeding ?**).
Saatgutwirtschaft 1958 : **10** : 72–75.

Reports from the Committee of the German Federal Variety Service are considered. Without naming any varieties, progress made during 1954–57 in improving cereals is surveyed.

3994 HÄNSEL, H.
Cereal breeding in Austria.
Euphytica, Wageningen 1958 : **7** : 59–82.

This comprehensive survey describes the development and present position of breeding of wheat, oats, barley and rye in Austria, information being given on climatic zones, breeding establishments, the Governmental Rules for the Registration of Varieties, methods, and the origin, geographical distribution, yield and other characters of the chief varieties.

3995 FAVERO, A.
Lusinghiere affermazioni di nuove varietà. (**Promising results from new varieties**).
Sementi elette 1958 : **4** : No. 1 : 41–46.

Prizes having been offered in Italy to breeders producing a wheat variety yielding 90 c. per ha., a rice yielding 130 c. and a maize 150 c., reference is made to competitive trials in which yields corresponding to 125·54 c. per ha. were produced by the rice Balilla a grana grossa [Large-grained Balilla] and 123·28 c. per ha. from the maize hybrid Cervino 13 x 8.

3996 Jaarverslag 1957. Instituut voor biologisch en scheikundig onderzoek van landbouwgewassen, Wageningen. (**Annual report, 1957. Institute for biological and chemical research on agricultural crops, Wageningen**) : No. 35 : Pp. 33.

The results reported include the observation that in three Ukrainian wheats resistance to heat damage depended on previous hardening while Peko wheat was relatively resistant to sudden hot conditions. A method of testing spring barley for tolerance of low pH values has been developed, which makes use of the fact that susceptibility is greatly increased in competition with oats.

3997 Cereal news from Canada.

Cereal News 1958 : **3** : No. 4 : 10–28.

Tabulated data are presented showing the yield per acre, percentage protein and protein per acre produced by five varieties of oats, five of barley and three of wheat at Whitehorse, Yukon. Greatest protein per acre was not produced by the recommended varieties.

Wheat. Progress is being made at the Canada Department of Agriculture Research Laboratory, Winnipeg, in setting up genetic stocks of spring wheat. It is noted that the University of Alberta proposes to release a soft white spring wheat from Kenya AC_2E_3 x Lemhi 2 under the name of Kenhi.

The prevalence of race 56 of *Puccinia graminis* var. *tritici* increased sharply in 1957 while race 15B decreased. Races I and II of *P. rubigo-vera* var. *tritici* became prevalent in Saskatchewan and Alberta for the first time.

Oats. At Nappan a plant in a foundation block of Scotian, planted in May 1956, was found to be green and leafy after the rest of the crop had matured. It was removed to the greenhouse in August and produced panicles the following spring but no seed was produced. It is now in its second spring and appears to be about to flower again. Throughout the two year period it has remained leafy, green and vigorous and free from *Leptosphaeria avenaria.* Two new races of *Puccinia graminis* var. *avenae*, 8a and 13a, were found in Canada in the autumn of 1957. Derivatives of White Russian are resistant to the first and *Avena strigosa* and Jostrain to the second. Race 7 was the most common with race 8 next. In the case of *P. coronata*, races pathogenic to varieties possessing the Bond or Victoria type of resistance have increased since 1945 and in 1957 races 213, 216, 274 and 279, which are pathogenic to both these varieties, comprised 44·4% of all isolates. Races 263, 264, 276 and 294, pathogenic to Landhafer and Santa Fe and to most of the varieties used in breeding for resistance, comprised 7% of the isolates. Three sources of resistance to these races are known, Ascenção, which is highly susceptible to *Helminthosporium victoriae*, this susceptibility being linked with rust resistance, Saia, which has $2n = 14$, and Ceirch Dubach, which is agronomically unsuited to Western Canada, where it rarely heads.

Barley. At Charlottetown, PEI, 30 two-rowed barley varieties and selections were tested with two isolates of *Helminthosporium sativum* (*Cochliobolus sativus*), one from Charlottetown 80 and the other from Piroline. The first isolate caused severe infection on 15 strains but the second only produced a severe attack on two. Strain 5088–8–4–1 (AB61) [N–C13–13 x (Anoidium x Fort^2)] was only slightly affected by either isolate.

At Ste. Anne de la Pocatière, 26 varieties or selections have been grown on acid soil with and without lime and a significant interaction between lime and variety was observed. Four varieties showed some tolerance of acid soils, namely Valentine, CI7028, Charlottetown 80 and H42 (Bolivia x Chevron).

Arrangements have been made in Canada to participate in the variety trials organized by the European Brewery Convention.

GB61, whose parentage is given as Stephen x Galore 2X OAC21 3X Peatland, has been released as York. Produced by the Ontario Agricultural College, it is a forage barley yielding as well or better than Brant, with good resistance to lodging and mildew and easy to thresh. It is adapted to conditions in Eastern Canada. In hull adherence tests, Br. 3902 had a particularly high dehulling percentage.

An isolate of *C. sativus* highly pathogenic to Vantage has been found at Edmonton. Vantmore and Olli are resistant to this form.

At Beaverlodge, an index of varietal efficiency, expressed as the number of pounds of grain produced per acre per day of development from seedling to maturity, has been worked out with a view to making possible the combination of high yield with early maturity. Based on tests carried out since 1951, Olli accumulated an average of 33·7 pounds of grain per acre per day. The assimilation efficiency of nine other varieties is given, expressed as a percentage of Olli, the best being Husky, 99·8%, Gateway, 99·5%, and Parkland 94·5%. The bearing of this index on the design of breeding programmes is discussed briefly.

Peas. Stirling showed 1% infection by *Ascochyta pisi* in the Ottawa Valley in 1957 while infection on Arthur was 6%. The former variety was shown, in greenhouse tests of 85 foundation lines, to have good tolerance to the four known races of the pathogen. A hybrid selection, 3884A (Chancellor x Early Raymond) x Stirling, which equals Chancellor, Arthur and Stirling in soup-making qualities, is being increased in the Ottawa Valley and at Lethbridge in 1958. It has outyielded the standard varieties and is slightly earlier in maturity.

3998 **Progress report on cereal and fodder plant investigations at Roseworthy Agricultural College.**
J. Dep. Agric. S. Aust. 1958 : **61** : 328–32.

Wheat. Of the advanced hybrid selections tested, RAC23 (Gabo x Florence x Dundee) was outstanding with respect to yield, giving 56 bushels per acre.

Oats. The following selections showed promise as oats for both grazing and grain: OXB3 [(Mulga x Belar) x Orient], OXB1 and OXB6 [Orient x (Mulga x Belar)], OXB10 [(Mulga x Belar) x Fulghum x Ballidu] and OXB12 [Orient x (Victoria x Richland x Boppy)].

3999 RAJHATHY, T. & KISS, A.
Autoploids and amphiploids in Triticinae produced at the Agricultural Research Institute of the Hungarian Academy of Science, Martonvasar, Hungary.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 23.

The list given includes four autoploids of *Triticum* species and two of *Secale cereale*, three *Triticum* amphiploids, 14 *Triticale* amphiploids and one *Triticale* x *Agropyron* amphiploid.

4000 BORDOVSKAJA, V. A.
(An experiment on changing spring cereals into winter).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 50–60. [Russian].

Taking the greatest possible care to use seed of homozygous material and to exclude all possibility of cross pollination and mechanical mixing, seed of 20 spring varieties belonging to *Triticum aestivum*, *T. durum*, *T. persicum*, *T. turgidum*, *T. dicoccum*, *Hordeum sativum*, *Avena sativa* and *Secale cereale* was sown at a series of successive dates in autumn in seven successive years, from 1949 to 1957; no change in winter hardiness, time of formation of the ear primordia, tillering or morphological features was detected. In those cases where plants of soft wheat appeared in autumn sowings of *T. persicum* and *T. durum* they also occurred in the spring-sown control and were evidently present in the initial material. Similarly the branched wheat tested contained admixtures of barley and unbranched forms of *T. aestivum* and *T. durum*; when these were removed before the beginning of the experiment no "conversions" were observed. The few aberrant plants that were found turned out to be either natural hybrids of *T. persicum* x *T. durum*, *T. turgidum* x *T. durum* or *T. persicum* x *S. cereale*.

Several further experiments are reported in which Lysenko's method of conversion was followed strictly but failed to give results. In those cases in which soft wheats appeared in treated material of *T. durum* 'Hordeiforme 27' and *T. persicum* it was also found to have been present in the initial material; when the admixtures were removed they also ceased to appear in the treated progeny.

4001 CARSON, G. P.
Descriptions of wheat and oat varieties.
J. nat. Inst. agric. Bot. 1957 : **8** : 27–35.

Descriptions are provided of the winter wheat Dominator [XXVII, 3903], spring wheats Fylgia II and Koga II and winter oat Powys [XXVII, 448], which have been provisionally recommended by the National Institute of Agricultural Botany, England.

4002 DELIU, A.
(Agricultural science in Albania and ways and means of promoting it).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 23–27. [Russian].

Mention is made of breeding work with cereals at the Mičurin Institute in Tirana and its branches. Tevere, Mentana, Quaderno and Impeto proved the most productive among early-ripening wheats and Cappelli and Beli Prolific among the late varieties. High yielding maize varieties with good quality grain have been selected from local material. They include Farmad [Large-grained] from a form originating from Peshkopi, Sulëva from a form in Elbasaen, Reči from Scutari and Bolgar from Central Albania.

4003 **Handbook of Canadian cereal varieties of barley, field beans, flax, oats, spring wheat and winter wheat.**
Plant Products Division, Production Service Department of Agriculture, Ottawa 1958 : Unpaginated.

Descriptions have been issued of the wheat Kent [XXVIII, 289], the oat Glen [XXVII, 3880] and barley York, which have been added to the official list of cereal varieties [XXII, p. 467]. York [(Stephan x Galore) x (OAC21 x Peatland)] is a six-rowed, smooth-awned fodder barley, developed at the Ontario Agricultural College and licensed in 1958. It has given high yields in eastern Canada and has good threshability.

4004 SVINAREV, V. I.
(The problem of the transformation of winter cereals into spring and vice versa).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 229–38. [Russian].

The author concurs with the criticisms of V. V. Skripčinskij [XXV, 2899] of the conversion experiments of the Lysenko school and presents tabular data showing that the majority of varieties approved for cultivation in the USSR have been produced by selection and hybridization. Even the spring form of Ukrainka wheat, claimed as a product of conversion, is probably a result of selection from a mixed population. Experiments are described in which a number of wheats were purified by successive generations of selection and then intercrossed. In some combinations the F_1 eared sooner than the earlier of the two parents, in some it eared later than the later parent and in others it was intermediate. In all crosses between winter and spring forms the spring habit was dominant but the results do not confirm Lysenko's statement that earliness is dominant in all cases. In the F_2 and later generations transgression occurred, forms both earlier and later than the parents and the F_1 being observed. From this it is concluded that lateness is conditioned by a number of recessive genes. Transgression for lateness was observed in crosses of forms of *Triticum durum* from Tunisia and Asia Minor with Russian forms of *T. durum* and in crosses of Chinese and Afghan forms of *T. aestivum* with Russian varieties. From these crosses, by selecting awnless segregates of *T. durum* with the highest yield, and the bread wheats with the greatest number of grains per ear, it was possible to create good winter forms of both *T. durum* and *T. aestivum* from crosses between two spring varieties. The view is presented that winter wheats first originated in this way by transgressive segregation in chance hybrids of spring wheats; they have usually been grown in the vicinity of spring wheats and have had the opportunity of constantly crossing with them. When placed in unusual conditions of development such varieties could segregate and, by the operation of selection, give rise to forms differing in developmental rhythm. In support of this view it is pointed out that in the reports of conversions mention has been made by the authors themselves of changes in morphological characters as well as in developmental characters.

4005 HITRINSKIJ, V. F.
(The importance of light for the development of winter hardiness and winter habit in spring rye and wheat).
Agrobiologija (Agrobiology) 1957 : No. 6 : 23–33. [Russian].

Training spring-wheat and spring-rye varieties for the winter habit at Odessa is discussed and observations on the effects of varied photoperiodic treatments upon conversion of spring into winter forms are presented. The highest number of winter forms was obtained by growing the plants in long days, with supplementary illumination provided by electric bulbs.

4006 ENČEV, Ja.
(Directed changes of inheritance in spring forms converted into winter forms).
Agrobiologija (Agrobiology) 1957 : No. 5 : 101–05. [Russian].

Training spring cereals, in particular wheat and barley, for the winter habit at Tošev and Sandrovo in Bulgaria is reported. The experiments with wheats showed that varieties grown as winter crops for two successive seasons overwintered better than the same varieties grown as winter crops for one year. Plants sown on 20 October in the second year showed a greater shift towards winter habit than the same variety sown on 28 October or 11 November. This was indicated by a higher rate of survival. The plants from early sowing in the second year were also distinguishable from the others by prostrate habit and improved resistance to lodging. In the case of Odessa 13, Lutescens 1163 and Komar, the change from spring into winter wheat was sometimes accompanied by conversion into other botanical varieties, for instance of var. *erythrospermum* into vars. *lutescens* or *milturum*. Winter barleys obtained from the spring varieties 103 and Odessa 9 showed increases in yield and improvements in hectolitre weights and malting properties.

4007 ROMMEL, M.
Eine vereinfachte Methode der Embryokultur bei Getreide. **(A simplified method of embryo culture for cereals).**
Züchter 1958 : **28** : 149–51.

Embryo culture is of use in raising interspecific or intergeneric hybrids which under normal conditions produce no viable seed on account of some inhibitory action of the endosperm on the development of the embryo; also when embryos are removed from unripe seeds, they do not pass through a stage of dormancy and so several generations may be raised in one year. The method described is suitable for the Gramineae. Procedures hitherto practised are simplified by using the ready-made preparation, Difco Orchid Agar, as the nutrient medium; this substance contains all the necessary nutrients and 3 g. per 100 ml. water is more than adequate. When unripe seeds are used, the best time for transplanting the embryos is 18–21 days after fertilization. Full details of the transplantation techniques used for unripe and dry seeds are included.

4008 Anderson, J. A.
1957 Report of the Grain Research Laboratory, Board of Grain Commissioners for Canada, Winnipeg, Manitoba. 1958 : Pp. 76.

Wheat. A total of 25 varieties of hard red spring wheat and 16 of amber durum wheat were tested. In the first group CT229 was classified as equal to Marquis in quality after three years' tests, CT233 and CT924 after two years and CT733 and CT735 after one year, with CT736 outstanding in baking quality. The results given by Reward indicate that it might be useful for crossing with varieties with strong physical dough properties but low protein content and baking strength in spite of its rust susceptibility. Of the United States varieties, Centana was considered to be of satisfactory quality and sufficiently valuable agronomically to be grown in Manitoba outside the rust area. The two durum varieties tested for three years, DT211 (= the US variety Ramsey) and DT141, were both equal in quality to Mindum but DT141 is so similar to Golden Ball in kernel appearance that it would present an insoluble grading problem if released. The same applies to DT144, DT146 and DT147, tested for two years, but of these DT144 is not equal to Mindum and the other two are borderline varieties. DT214 (Langdon) was classed as equal to Mindum except in respect of gluten and mixing characteristics. Six of the seven varieties tested for one year present the same problem of similarity to Golden Ball but only two, DT148 and DT149, are equal to Mindum.

Barley. In tests of pearling quality, Betzes, Heimdal and Lenta were the best of the two-rowed varieties and Olli, Montcalm, Parkland, Traill, Husky, Vantage and Vantmore compared favourably with OAC21 in the six-rowed group. A detailed comparison of the quality of Canadian Thorpe and Hannchen has been carried out and is briefly reported. In tests of malting quality none of the varieties tested for three years is equal to OAC21. Two have been released, ND103 as Traill [XXVI, 3305 and 3307] and UM570 as Swan [XXVII, 3880 and XXVIII, 1658], but they are eligible only for feed grades. Three selections, GB61 from the Ontario Agricultural College and 6940 and 7940 from Macdonald College, are being retained for further testing. In the first year's tests GB61 has shown a low wort nitrogen content while the other two are somewhat similar to Montcalm. A two-rowed variety from Europe, Piroline (Heine 505), has given promising results in two years' testing.

4009 McFadden, A. D. & Kaufmann, M. L.
What about yield ?
Cereal News 1958 : **3** : No. **4** : 3–6.

It is suggested that breeding for a particular objective, although of great value, may result in the loss of heritable factors contributing to yield. The possibility of improving methods of selection for yield is discussed.

4010 Segeťa, V.
Jednoduchá metoda určení odolnosti ozimých obilovin proti některým škodlivým činitelům zimy. (**A simple method for determining the resistance of winter cereals to several harmful winter effects.**)
Věd. Práce výzk. Ústav. rostlin. Výrob. 1957 : **3** : 83–96.

A technique for testing resistance to low temperatures, drought and other forms of winter injury has been devised. It is thought to be valuable for institutes engaged in breeding winter cereals. The method involves placing boxes containing the plants on stands in the open and periodical transfer to a greenhouse.

4011 Cikov, D. & Stoilov, M.
Studies on the accumulation of dry matter, the dynamics of water content and the germination power of some varieties of wheat and rye during the period of seed formation.
Izv. biol. Inst. (Bull. biol. Inst.), Sofija 1951 : **2** : 45–66. [From: Résumés des travaux publiés par l'Académie des Sciences de Bulgarie en 1951 et 1952, Sofija 1958 : 33–34. (Abst.)]

These investigations were carried out with five varieties of wheat and two of rye. It is suggested that differences between top and basal spikelets in respect of water content and water consumption may be indicative of drought resistance; the smaller the differences, the greater is the resistance. The water content of seeds was found to stay at a constant level from the middle of the milk stage of maturity to the end of the waxy stage; varieties which pass quickly through this stage of development are less affected by unfavourable weather.

4012 Gray, E. G.
Some physiologic races of *Ustilago hordei* and *U. avenae* in Scotland.
Plant Path. 1958 : **7** : 14–16.

Samples of *U. hordei* from barley varieties were identical with the American race 6. A mixture of these spores infected the barley variety Maja but not Anoidium, Hokudo, Ogalitsu, Harlan or Jet. Other samples of *U. hordei* from *Avena strigosa* infected S171 (*A. strigosa* x *A. brevis*), a variety reputed to be resistant to smuts; these cultures also infected selections of *A. byzantina* and *A. barbata* x *A. strigosa* but had no effect on S75 or any variety of *A. sativa.* On *A. sativa,* a race was found which could not be identified with any known race; of all the American test varieties, only one, Anthony, was infected. Collections of *U. avenae* from *A. sativa* were identical with the American race A1. In a series of trials three selections of *A. brevis,* lines of *A. strigosa* from various countries and S75 were resistant to a mixture of the oat smut collections. Other species of *Avena* were not infected by this inoculum in a single trial.

4013 Teltscherová, L.
K otázce stadijnosti československých odrůd žita a ovsa. (**The question of phasic development of Czechoslovakian varieties of rye and oats**).
Věd. Práce výzk. Útsav. rostlin. Výrob. 1957 : **3** : 111–23.

Tabulated data on the duration of the vernalization and light phases of the principal varieties are presented. Winter-rye varieties from southern Moravia and Slovakia were found to have a shorter light phase than varieties grown in more northerly districts.

WHEAT

4014 Matsumura, S. & Fujii, T.
Genetic effects of ionizing radiation in Einkorn wheat.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 6–7.

The mean single spike fertility of plants grown from X-irradiated seed decreased with the decrease of chromosome aberrations and chlorophyll mutations showed some increase, although the aberration frequency at 20KVP was higher than expected and at 50KVP lower than expected.

4015 Rivett, A. D.
Winter wheat variety trials: 1952–1956 (Juliana control).
J. nat. Inst. agric. Bot. 1957 : **8** : 19–26.

A summary is given of the results of 28 trials of the late-maturing winter wheats Banco, New Wilma, Victor II, Gregor, Odin, K01580 and W6 in England and Scotland. Banco proved the most promising variety, having good bread-making quality and showing an all-round improvement over Juliana, particularly in yield.

4016 Oktaba, W., Rejmak, W. & Warteresiewicz, M.
Efektywność metody uwikłanej i jej zastosowanie dla zbadania wpływu gęstości wysiewu i poziomów nawożenia azotowego na plony czterech odmian pszenicy jarej. (**Efficiency of the method of confounding and its use in the investigations on the influence of sowing density and nitrogen dressing levels on the yield of four varieties of spring wheat**).
Ann. Univ. M. Curie-Skłodowska : Sect. E. : 1956 : **11** : 187–226.

The use of the above type of design [cf. 3606] proved more efficient than a randomized-block design. Significant intervarietal differences in grain and straw yield, 1000-grain weight, hectolitre weight and plant height were observed. Differences in response to N fertilizer treatment were also found.

4017 Papp, Zs.
Őszibúza fajtákkal végzett hároméves kísérletsorozat. (**Three-year trial series with winter wheat**).
Növénytermelés 1957 : **6** : 97–108.

[Cf. 2613].

4018 Luk'janenko, P. P.
(**The result of breeding winter wheat in the Kuban'**).
Agrobiologija (Agrobiology) 1957 : No. 5 : 30–35. [Russian].

A report on wheat breeding at Krasnodar, together with descriptions of Skorospelka 3b [Early 3b] and Bezostaja 4/1 [Awnless 4/1] is presented [cf. XXVI, 3193].

4019 Priadčenko [Priadcencu], A., Melakrinos [Melacrinos], A., Enesku [Enescu], S. & Boldja [Boldea], E.
(A winter form of Arnăut wheat).
Selekeija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 73–74. [Russian].

[Cf. XXVI, 3181 and XXVIII, 288].

4020 Séguéla, J. M.
Enseignements techniques à tirer de la campagne de céréales 1956–57. **(Technical information obtainable from the cereal season, 1956–57).**
Tunis. agric. 1958 : **59** : 1–29.

The relative merits of wheat varieties commonly cultivated in Tunisia are considered; some information is provided on yielding capacity, resistance to disease and quality. The results of trials of introductions and recent hybrids are also mentioned.

4021 Grillot, G.
État actuel des recherches et travaux sur le blé dur au Maroc. **(The present state of research and work on hard wheat in Morocco).**
Terre maroc. 1955 : No. 307 : 1–8.

The results are reported of varietal trials held in several districts of Morocco. Of the new varieties, the hard wheat 3225 (Bishri x Bouteille [Bottle]) was found most promising for cultivation without irrigation; it is particularly early. Bouteille 2780 was the best variety on heavy soils in north Morocco. Breeding of new varieties adapted to Moroccan conditions is in progress.

4022 Peterson, R. F.
Twenty-five years' progress in breeding new varieties of wheat for Canada.
Emp. J. exp. Agric. 1958 : **26** : 104–22.

After describing the organization of wheat breeding and research in Canada since 1933 the author lists the 33 varieties licensed in Canada since that date and discusses their characters and performance. Mention is also made of research carried out at several government and university laboratories.

4023 Briggle, L. W.
Report of the Uniform Southern Soft Wheat Nurseries for 1957.
US Dep. Agric., Agric. Res. Serv., Crops Res. Div., Pl. Industr. Sta., Beltsville, Md. 1958 : Pp. 29. (Mimeographed).

This report of observations on 18 varieties at 29 centres in the south of the USA includes data on yield, test weight, heading dates, lodging, plant height, and reactions to leaf and stem rust, mildew, *Septoria* (*Leptosphaeria*) *nodorum*, *S. tritici*, soil-borne mosaic and Hessian fly.

4024 Day, A. D. & Massey, G. D.
Yield and quality of spring wheat varieties grown as winter annuals under irrigation.
Agron. J. 1958 : **50** : 286–87.

The results are presented of a three-year trial of six spring wheats grown as winter annuals under irrigation in Arizona. The highest yields were obtained from Awned Onas and Baart 46 but their milling quality was poor. Ramona, the check variety, was of good milling quality.

4025 Villanueva N., R. & Romero L., M.
Comparativo de rendimientos de las selecciones de trigo—Campaña 1956. **(Comparison of yields of wheat selections. Season 1956).**
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 363 : 7–11. (Mimeographed).

Tabulated data on yields, disease resistance and lodging percentage are given for numerous selections tested in Peru.

4026 Copp, L. G. L.
Aotea wheat—a replacement for cross 7.
NZ J. Agric. 1958 : **96** : 210–14.

A detailed account is given of the origin and characters of the above variety [cf. 1367 and 1470].

4027 Hore, H. L.
Recommended wheat varieties.
J. Dep. Agric. Vict. 1958 : **56** : 137–42.

Varieties recommended for Victoria include Beacon (Baldmin x Quadrat) which was distributed in 1958 and is a sister line of Olympic [cf. XXVII, 3910]. Beacon offers a further improvement in baking quality over Olympic, although its yielding ability is somewhat lower. It possesses good resistance to flag smut.

4028 Fujii, T.
Studies on chlorophyll mutants in diploid wheat induced by radiation.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 8.

All the F_1 progeny from *chlorina* mutants with light green leaves, and *basi-viridis* II mutants, with the base of the leaves yellowish green, were morphologically normal with high germinating capacity and seed fertility. Segregation in the F_2 indicated that the characters were independently controlled by one recessive gene in each case. The chlorophyll content of the mutants was about 50% of that of the normal plants, although the green colour of the *basi-viridis* II type could be increased to the normal level by treatment with fluorescent lamps at 20° C. in the dark phytotron. The double-recessive plants showed only 20% of the normal chlorophyll content but this could be raised in the phytotron to the level of the *chlorina* mutant. It is suggested that the *chlorina* gene may be epistatic to the *basi-viridis* II gene. [Cf. 3895].

4029 SHARMAN, B. C.
'Purple pericarp': a monofactorial dominant in tetraploid wheats.
Nature, Lond. 1958 : **181** : p. 929.

In a cross of a white-grained variety of *Triticum durum* from Cyprus with purple-grained *T. durum* var. *arraseita* from Abyssinia, the pericarp colour of the latter wheat was inherited as a monogenic dominant character.

4030 YAMASHITA, K.
Further studies on the synthesis of a permanent RT-heterozygote in Einkorn wheat.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 4–5.

Strains have been obtained carrying *lethal*-2 on chromosome f, with this chromosome involved in a ring complex. Segregation of ⑥ + 4_{II} and 7_{II} was 2 : 1 in these strains, indicating that half the 7_{II} segregates died as a result of the balanced lethal mechanism, while in strains with f not involved in the ring complex a 1 : 1 segregation was obtained [cf. XXVII, 401].

4031 MEDVEDEVA, G. B.
(The influence of a pollen mentor upon the inheritance of characters in wheat).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **113** : 1158–60. [Russian].

The results of a study of the F_1 and F_2 of wheat hybrids obtained by using a pollen mixture of two varieties, both different from the seed parent and one dominant for ear colour and the other for grain colour or ear pubescence, are discussed. It was found that one pollen parent often weakened the inheritance of characters from the other pollen parent. The F_1 comprised plants with (1) the dominant character of one pollinator, (2) the dominant characters of both pollinators or (3) both characters recessive. In the F_2 the segregation ratios were either aberrant or corresponded to those of an ordinary hybrid between two varieties.

4032 POHLENDT, G.
Variabilität der Chromosomenzahlen und andere Kernpathologien in *Aegilops triuncialis* x *Triticum aestivum*-Bastarden.
(Variability of the chromosome numbers and other nuclear disorders in *Ae. triuncialis* x *T. aestivum* hybrids).
Z. VererbLehre 1958 : **89** : 170–88.

Cytological investigations were made of spontaneous and experimental F_1 progeny from the cross *Ae. truncialis* x *T. aestivum* and of a spontaneous F_2 generation. Variation in chromosome number within a plant was found in root tips, aerial plant organs and pollen mother cells; chromosome numbers ranging from 3 to over 60 were found. The F_1 progeny was phenotypically uniform with many *Aegilops* characters dominating; in the F_2 phenotypic mosaics of *Aegilops* and wheat characters occurred. Various abnormalities were observed in nuclei of somatic tissues, including fragmentation, multipolar spindles, with more than four poles in some cases, multinucleate cells and bridges; in pollen mother cells, fragmentation and recombination, tripolar or tetrapolar spindles and clumping of chromosomes occurred. Rings of chromosomes were seen in telophase, prophase and early metaphase of nuclei derived from mother nuclei with multipolar spindles. Chromosomes of the two parental types were arranged at random on the spindle in multipolar nuclei and there was no sorting out of the two types of chromosome. Considerable variation in the number of bivalents was found in F_1 and F_2 pollen mother cells.

The abnormal cytological behaviour is thought to be related to metabolic disturbances. Possible causes of the occurrence of variable chromosome numbers are discussed.

4033 ŽEBRAK, A. R.
(Polyploid species of wheat).
Izdatel'stvo Akademii Nauk SSR 1957 : Pp. 125. [Russian].

In an historical review of the use of colchicine and other agents for inducing polyploidy a number of fertile amphidiploids produced in this way in the USSR and elsewhere are enumerated. These include various wheat hybrids produced by the author. The work of a number of authors is reviewed in support of the viewpoint that polyploid species are more prevalent in extreme climatic conditions and that the majority of genera have evolved in the direction of an increase in chromosome number. The early literature on hybrids of *Triticum* spp. with species of other genera is reviewed; the presence of genomes in common between *Triticum* and both *Aegilops* and *Agropyron* is contrasted with their absence in the case of wheat and rye, on the basis of which the possibility of conversion from one to the other is denied.

Descriptions are then given of the various amphidiploid hybrids produced by the author. The first is *T. durum* x *T. monococcum*, in which $2n = 42$; the plants are smaller than the sterile hybrid but fertile, the mean number of grains per spikelet being 1·7 compared with 2·7 in *T. durum*.

The amphidiploids of *T. durum* x *T. timopheevi* bear over 2 grains per spikelet; they have $2n = 56$ and have been named *T. soveticum*; they have inherited resistance to *Erysiphe graminis* from *T. timopheevi*. The technique used in their production was first to select the forms of *T. timopheevi* with the best ears and pollinate these with a range of different forms of *T. durum*; 992 florets pollinated with Hordeiforme 010 gave rise to 342 hybrid grains; 271 grains were treated with colchicine and 82 seedlings obtained. Many of them produced occasional amphidiploid grains, 12 ears were entirely amphidiploid and quite a number were chimeras. Experiments are described in which the number of grains per ear was considerably increased by the addition of nutrient solutions whereas the same doses of solution added to the sterile hybrids caused no increase in fertility. An amphidiploid produced by crossing two autotetraploids obtained by colchicine treatment of the same parental forms was in all respects identical with the amphidiploids produced by treating the sterile F_1. By this latter method amphidiploids were obtained from 16 other combinations of *T. durum* x *T. timopheevi* or the reciprocals; in general characters they resembled the amphidiploid described above.

Hybrid grains from a cross of *T. polonicum* x *T. durum* were also treated with colchicine; only two seedlings were obtained from 23 treated grains; one of these was normal but the other displayed wide variations in fertility; some of the grains formed gave rise to seedlings with $2n = 56$; in morphological features they were intermediate between the two species but they were smaller than the hybrids with 28 chromosomes, matured 2–3 days later and were much reduced in fertility, having 0·172 grains per spikelet as against 2·78. From open pollination of 98 ears only 70 grains were obtained. Other ears were pollinated, without emasculation, with other species and hybrids and formed 168 grains, with an average of 0·49 grains per spikelet. The following hybrids were obtained in this way: [(*T. polonicum* x *T. durum*) x *T. vulgare*] $2n = 49$; [(*T. polonicum* x *T. durum*) x *T. timopheevi*] $2n = 42$; [(*T. polonicum* x *T. durum*) x (*T. durum* x *T. timopheevi*)] $2n = 56$.

The reduced fertility of the *T. durum* x *T. polonicum* hybrids after chromosome doubling is taken as further evidence of the homology of the genomes of *T. durum* and *T. polonicum*. Amphidiploids of *T. polonicum* x *T. timopheevi* on the other hand resembled those of *T. durum* x *T. timopheevi* in fertility and formed about 2 grains per spikelet. They too were resistant to *E. graminis*.

By pollinating 204 florets of *T. orientale* var. *insigne* with *T. timopheevi* 7 grains were obtained; after colchicine treatment six seedlings were produced, 5 of which bore amphidiploid ears, in which some of the spikelets bore up to 3 grains, the mean number being 2·3. The grains were large, with a 1000-grain weight of 95 g. This amphidiploid also had $2n = 56$. It was not completely resistant to *E. graminis*, in which respect it differs from the corresponding hybrid of *T. durum*; it differed also in morphological features and on this basis the author disagrees with those investigators who regard *T. orientale* as a variety of *T. durum*. The amphidiploid is classified as a distinct botanical variety of *T. soveticum*.

Amphidiploids were obtained from three varieties of *T. persicum* x *T. timopheevi*; all had $2n = 56$ and were resistant to mildew, rust and a number of other fungous diseases.

A form of *T. turgidum* var. *rubroatrum* from Bavaria, characterized by up to 135–140 grains per ear, was crossed with *T. timopheevi* and after colchicine treatment of the grains some amphidiploids were obtained in which the ears had 24–25 spikelets or more, many of them having 4 grains per spikelet, the mean number being 3·15. This and other amphidiploids from different varieties of *T. turgidum* x *T. timopheevi* had $2n = 56$.

Crosses of *T. vulgare* x *T. timopheevi* gave grains with somewhat higher germinating capacity than the reciprocal. Amphidiploids from 11 different varieties of *T. vulgare* all have $2n = 70$. Almost all are awnless; some are winter wheats but the majority are spring. Their fertility is lower than that of the better varieties of *T. vulgare*.

Large numbers of crosses were made between varieties of *T. vulgare* and *T. durum* and after treatment with colchicine fertile ears were obtained from three combinations, viz. *T.*

durum var. *hordeiforme* 'Arnautka Kočina' x *T. vulgare* var. *lutescens* '062', *T. durum* var. *melanopus* 'Falcata 21111' x *T. vulgare* var. *lutescens* '062' and *T. durum* var. *hordeiforme* 'Arnautka Kočina' x *T. vulgare* var. *milturum* 'S–553'. Some ears bore as many as 34 grains, which were vitreous, almost spherical and much larger than those of the average bread wheat. All three amphidiploids had $2n = 70$; segregation occurred in the later generations in respect of fertility and certain morphological characters; in some F_5 and F_6 plants bearing 3–4 grains per spikelet and over 200 per plant the chromosome number had fallen to 56–58; in others it was 64–68. Some highly fertile, constant forms with good grains have been selected from the second of the crosses mentioned.

The 56-chromosome amphidiploids have been intercrossed in different combinations, after which they were allowed to open pollinate in the presence of desirable varieties of *T. vulgare*. By selection in the progeny a number of lines have been isolated which resemble the bread wheats in general characters while possessing one or two features of other species, one of the most promising being a selection from [(*T. turgidum* x *T. timopheevi*) x (*T. persicum* x *T. timopheevi*)] x *T. vulgare*.

A study was made of the inheritance of characters when the amphidiploid *T. turgidum* var. *rubroatrum* x *T. timopheevi* ($2n = 56$) was pollinated by *T. vulgare* ($2n = 42$). The resulting seedlings had $2n = 49$, some of them were taller than the parents, all had pubescent ears and pubescent leaves, the leaf pubescence being less pronounced than in *T. timopheevi* or the amphidiploid; the ears were awnless as in the *T. vulgare* variety used and tended to be more dense; the number of grains per ear was very low but a few true-breeding forms were obtained in later generations, some of them corresponding to *T. compactum* and bearing from 21 to 51 grains per ear; they behaved as winter wheats. Most of them had a brittle rachis.

In pollinations of *T. durum* with the 56-chromosome amphidiploids no seed was set but two of the reciprocal combinations were successful and produced 27 grains which were small and low in germinating capacity, only 8 seedlings being obtained; these bore only 9·7 grains per plant, the mean number per ear being 6·75 and per spikelet 0·4. Only two of the 8 sesquidiploids had $2n = 42$; two had 40, while one each had 41, 39, 38 and 37. In spite of the reduced proportion of *T. timopheevi* genomes the hybrids all had pubescent glumes. A further set of sesquidiploids was produced by crossing *T. durum* x *T. timopheevi* ($2n = 56$) with *T. durum* 'B–11', which is awnless, and *T. durum* var. *melanopus* '069', which is awned; all had pubescent leaves and glumes and were resistant to mildew. Those from the former cross were awnless and those from the latter had awns.

Sesquidiploids of soft wheat were obtained by crossing *T. vulgare* x *T. timopheevi* ($2n = 70$) with *T. vulgare*. In ear density they were intermediate; all had pubescent glumes and brittle rachis. When the pollinating form of *T. vulgare* was awnless the sesquidiploids were also awnless. The mean number of grains per spikelet was 0·97. Two plants had $2n = 55$–56, four had 54–55, one each had 53, 52 and 51, three had 50, five 49, two 47–48, one 45 and one 42. In the third and fourth generations of these sesquidiploids fully fertile forms resembling *T. vulgare* but with pubescent leaves and glumes have been selected; others have grains resembling those of *T. timopheevi*.

Trihaploid wheat-rye hybrids were produced by pollinating *T. turgidum* x *T. timopheevi* ($2n = 50$) with *Secale cereale* 'Vjatka'. From 872 florets pollinated, 66 grains were formed, from which, after colchicine treatment, 17 seedlings were obtained; they were vigorous and had inherited the type of pubescence characteristic of *T. timopheevi*, the pigmentation of rye and the solid straw of *T. turgidum*; their chromosome number was 34–35 and they were entirely sterile.

Data from trials of the hybrids show that some of the selections from crosses of the amphidiploid *T. turgidum* x *T. timopheevi* with *T. vulgare* were free from lodging, resistant to the main diseases and superior to the standard wheat in part of the Moscow area by up to 27% in yield of grain. Hybrid 564 is specially mentioned as being resistant to brown rust and lodging.

4034 Watanabe, Y., Mukade, K. & Yamada, M.

Introduction of the leaf-rust resistance to wheat variety from *T. Timopheevi*.

Wheat Inform. Serv. Kyoto 1957 : No. 6. : 9–10.

One plant out of six obtained from the cross (*Triticum vulgare* 'Fultz 1' x *T. timopheevi*) x Fultz 1 was found to possess seedling and adult resistance to race 21 of *Puccinia triticina* and was fertile. In the following generation 46 out of 149 plants showed the same high resistance and 11 strains which appeared to be homozygous for resistance were selected. The chromosome numbers of plants in this and the following generation were $2n = 40$, 41 or 42, with one fragment in some cases, and in all $2n = 42$ plants examined chromosome pairing was complete, with 21_{II}. These and later generations showed a wide range of segregation of morphological characters but no tendency for glume adherence such as is found in *T. timopheevi.* Seed fertility was high and the plants matured a little later than winter wheat varieties. They were severely attacked by *P. graminis* var. *tritici* in June 1957.

4035 KRYŽANOVSKIJ, F. D.
(New forms of cereal crops).
Priroda (Nature), Leningrad 1958 : No. 4 : 101–04. [Russian].

This report on breeding work with *Triticum-Agropyron* hybrids at the Snegiri Experimental Base of the Principal Botanic Garden mentions a great diversity of new forms of wheat. Some of these breed true and possess important economic characteristics such as hardiness, resistance to lodging or fungous diseases and productive ears. They were obtained by intercrossing existing *Triticum-Agropyron* hybrids or crossing these with squarehead wheats. Among the practical results are the forage types M164, A10 and M2, which are productive of highly nutritious hay, and some new winter wheats with good baking and milling properties. The latter include variety 1800 and Hybrid 1 [cf. 1408].

4036 TABUSHI, J.
Chromosome pairing in the progenies of synthesized 6x-wheat, ABD No. 4.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 10.

A table is given showing the chromosome configurations at metaphase I in 1956 and 1957 of $2n = 42$ progeny from the cross emmer wheat x *Aegilops squarrosa*, made in 1948.

4037 KIHARA, H., YAMASHITA, K., TANAKA, M. & TABUSHI, J.
Some aspects of the new amphidiploids synthesized from the hybrids, Emmer wheats x *Aegilops squarrosa* var. *strangulata*.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 14–15.

Triploid F_1 progeny have been obtained from crosses between *Triticum dicoccoides* var. *spontaneo-nigrum*, *T. persicum* var. *stramineum*, *T. persicum* var. *fuliginosum* and *T. durum* var. *reichenbachii*, on the one hand, and *Ae. squarrosa* var. *strangulata* on the other. Pollen fertility was high and seed fertility moderately high in all except the first cross, with both pollen and seed fertility higher in later heads than in early heads.

4038 FUKASAWA, H.
Studies on restoration and substitution of nucleus (genome) in *Aegilotricum*, III. Cyto-histological investigation of pollen degeneration in anthers of male-sterile plants.
Cytologia, Tokyo 1956 : **21** : 97–106.

In male-sterile plants of *Aegilotricum* (amphidiploid between *Aegilops ovata* ♀ and *Triticum durum*), abortion of the pollen grains was due to abnormalities of the first pollen mitosis. Successive back crossing to *T. durum* did not alter the stage at which degeneration occurred. Abortion was not associated with any irregularities of the tapetal cells.

4039 KUMP, M.
Genetical investigation on *Triticum vulgare* x *Secale cereale* hybrid. I. Study of some transgressive characters of the culm and ear in the F_4 generation.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 18–20.

Evidence is presented from which it is concluded that the "presence of one rye chromosome in the genome does not cause depression in the development of the kernels. This effect may be attributed to the negative action of another rye chromosome or part of it in the genome or to the action of cytoplasmatical factors".

4040 NAKAJIMA, G.
(F_1 plants of *Triticum pyramidale* x *Secale fragile*).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 194–98. [Japanese].

A morphological description of the F_1 hybrid is given. The hybrids were more similar to the rye parent than to the wheat in respect of inflorescence structure. No stamens or gynecia were formed.

4041 KLJUČAREVA, M.
(An explanation of the modes of origin of forms with maternal inheritance in crosses of rye with wheat).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **113** : 207–09. [Russian].

Embryological observations on the development of plants of rye type obtained by pollinating emasculated rye flowers with wheat pollen are presented. The pollen tubes ceased growing down the style prematurely and discharged their contents before reaching the ovule. The pollen contents passed through the stylar tissues to the embryo sac where they first stimulated growth of the ovule and the ovary and caused the embryo sac to enlarge. Next, physiological and biochemical changes took place in the synergids. These eventually disintegrated and the products of disintegration enveloped the egg cell and penetrated its cytoplasm and nucleus. Most of the resulting embryos were diploid ($2n = 14$) but a few were haploid-diploid chimeras initially. The embryos gave rise to plants indistinguishable from rye.

4042 CHU, K.-H. & YANG, C.-F.
(**Preliminary studies of crossability between wheat and *Agropyron***).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1958 : **9** : 56–63. (Chinese].

Information is provided on the seed set and percentage germination of numerous crosses involving Chinese varieties of *Triticum vulgare*, *T. turgidum* or *T. durum* as female parent and selected strains of *A. elongatum* or *A. glaucum* as pollen parent. Some advantages in triple or double applications of pollen over single pollinations are noted.

4043 MARKARIAN, D.
X-rays create wide variation in plant hybrids.
What's New Crop Soils 1958 : **10** : No. **6** : p. 19.

Mention is made of the use of X rays to cause chromosome breakage and recombination, resulting in greater variation in the progeny, in wheat x *Agropyron* hybrids. It is hoped that this treatment may make possible the combination of good seed quality with good forage production.

4044 PISAREV, V. E.
(**Using polyploidy in plant breeding**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. **9** : 35–45. [Russian].

The substance of this article is the same as that of a report already summarized [281]. Supplementary information includes a reference to new amphidiploids of *Triticum timopheevi* x *T. durum*, characterized by a protein content of 22·25–23·82%.

4045 VLK, J.
Využití vegetativní hybridisace při vnitroodrůdovém křížení pšenice. (**Utilizing vegetative hybridization in intra-varietal crossing of wheat**).
Sborn. vysok. Šk. zeměd. Praze 1956 : 171–78.

Czechoslovakian experiments on eliminating inbreeding depression in spring wheats by graft hybridization and intercrossing the resulting vegetative hybrids are in progress. Among the V_0 plants studied, the graft hybrids of Stupicka Vouska [Stupice Awned] showed improvements in 1000-grain and hectolitre weight.

4046 PAPP, ZS.
Új elimert őszibúzafajták. (**New certified winter wheat varieties**).
Magyar Mezogazdaság 1957 : **19** : 6–7. [From Hungar. agric. Rev. 1958 : **7** : p. 2. (Abst.)].

Fertőd 293 [Bánkút 1201 x Kawvale] gives slightly higher yields than Bánkút 1201, has thin, elastic straw and a 1000-grain weight of 38·43 g., ripens early and shows improved resistance to smut and stem rust. Kompolt 169, selected from Fleischmann 481, is earlier, stiffer-strawed and higher-yielding than the parent variety.

4047 POPOW, G.
Kärntner früher Sommerweizen, eine neue Sorte im schweizerischen Richtsortiment. (**Carinthian early spring wheat, a new variety in the Swiss official collection**).
Mitt. schweiz. Landw. 1958 : **6** : 77–80.

This new Austrian wheat has been provisionally entered on the Swiss official list of varieties. It is not suitable for low-lying districts but is recommended for cultivation in higher regions on account of its early ripening and resistance to rusts; it is not attacked by *Puccinia triticina* and only slightly attacked by *P. graminis* var. *tritici* and *P. glumarum*. In high districts the yielding capacity is comparable to that of Huron and Lichti and the resistance to lodging is greater. The thousand-grain weight is 40–45 g. and tillering is not quite so good as that of other varieties on the official list; the new variety is awnless.

4048 KIRIYAMA, T. *et al.*
(**On the new wheat variety Yutakakomugi**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1957 : **4** : 487–508. [Japanese].

Yutakakomugi [Abundance wheat], registered as Norin 92 [Ministry of Agriculture and Forestry 92], is a selection of Saikai 75 x Saikai 78. It is a midseason type adapted to lowland cultivation in Kyushu. The 1000-grain weight is 33·7 g. Its degree of resistance to rusts and virus resembles that of Norin 61 but it is less resistant to mildew and is susceptible to *Gibberella zeae*.

4049 McNeal, F. H.
Centana spring wheat.
Circ. Mont. agric. Exp. Sta. 1958 : No. 217 : Pp. 7.

Centana was developed at Montana Agricultural Station from a cross of (Pilot x Thatcher) x Pilot. It is recommended for central areas of Montana where it has yielded well in comparison with Pilot, Ceres and Thatcher; the test weight of Centana is about equal to that of Ceres. The quality is comparable to that of Thatcher. Centana is susceptible to leaf and stem rusts but fairly resistant to *Tilletia tritici.*

4050 Čanov, T. V. & Sedova, K. A.
(The winter-wheat variety Gor'kovčanka).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 56–57. [Russian].

Gor'kovčanka [wheat from Gor'kij] was selected from a local variety grown in the Mari ASSR. It outyields Ul'janovka and other standards in the province of Gor'kij and is resistant to lodging, shedding and winter injury. Plants harvested late give a lower percentage of grain germinating in the field than Ul'janovka and the percentage of vitreous grain is higher. Its baking quality is good.

4051 Okamoto, M.
Further information on identification of the chromosomes in the A and B genomes.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 3–4.

From further results of the studies previously reported [269], it is now stated that chromosomes VI, IX, XI and XII are in the A genome and I, III, V, VII, VIII and X in the B genome and it is assumed the A genome is completed by chromosomes XIV and IV. These results are discussed briefly with reference to conflicting results obtained by other workers.

4052 Matsumura, S.
Radiation genetics in wheat. III. Relation between chromosome aberrations and X-ray dose or wave length in a diploid wheat.
Cytologia, Tokyo 1956 : **21** : 107–13.

When dormant seeds of *Triticum monococcum* vars. *vulgare* and *flavescens* were exposed to unfiltered doses ranging from 5400 to 13,500 r. at 180 KVP and 3 mA tube current, the frequency of X_1 chromosome aberrations increased in a linear manner as the dose increased. With a constant dose of 8100 r. at 80–180 KVP, the frequency of aberrations decreased with increasing wave length. Var. *flavescens* was more tolerant of X irradiation than var. *vulgare.* [cf. XXVI, 2198 and XXVII, 196].

4053 Sears, E. R.
Effect of chromosomes XII and XVI on the action of Neatby's virescent.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 1.

All the virescent offspring of plants monosomic for chromosome XVI and heterozygous for *v* are disomic and 15–20% of the seeds produced by these monosomic plants are shrivelled, indicating that the combination monosomic XVI *vv* is a seed lethal. Other results show that monosomic XII *vv* results in poor viability or is lethal. One virescent offspring of monosomic XVI *Vv* had a small white sector and carried one normal and one isochromosome and gave progeny carrying 2–5 replications of the arm of XVI involved in the isochromosome. It is suggested that these results confirm that *V* is a member of a triplicate gene series concerned with chlorophyll development [cf. XXVII, 358].

4054 Larson, R. I.
Cytogenetics of solid stem in common wheat: monosomic F_2 analysis of the variety S-615.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 2–3.

Using monosomic lines of Chinese Spring x S–615 it has been shown that genes for hollow stem in Chinese Spring are located on chromosomes XII, XIX, XX and XXI and that Chinese Spring chromosome VIII carries a gene for solid stem not possessed by S–615. Some evidence was obtained that chromosomes affect pith distribution, monosomic XVIII showing a characteristic pith pattern in hybrids with several varieties. The results confirm previous reports that loss of any of the chromosomes of the D genome results in a more solid culm.

4055 Matsumura, S., Fujii, T. & Kondô, S.
Effects of X- and γ-radiations upon wheat seedlings and their modification due to temperature or polyploidy.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 7–8.

Dormant seeds of *Triticum monococcum* were subjected to irradiation by X rays and γ rays at 10 and 20 Kr. and sown immediately or after 30 days storage while others were treated with chronic γ-irradiation for 54 days. At 20 Kr. the germination rate was reduced by both types of radiation though after 30 days storage this reduction was more marked in the case of γ rays while when the seeds were sown immediately those X irradiated showed a more marked reduction. Lower storage temperatures also inhibited growth, especially of γ-irradiated seeds, this effect being more pronounced with acute irradiation.

Dormant seeds of *T. monococcum* 2*x*, *T. durum* 4*x* and *T. vulgare* 4*x* were exposed to X rays and γ rays at 10 to 40 Kr. Inhibition of germination and seedling growth was more marked with γ-irradiation, 2*x* plants being the most sensitive and 6*x* most resistant, although there was no significant difference between 4*x* and 6*x*.

4056 NAGAI, T.
(On leaf-catalase activity associated with the development of wheat varieties differing with respect to spring or winter habit).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 119–20. [Japanese].

Eight varieties were studied, four spring wheat and four winter wheats. In one experiment, all the varieties were sown in the autumn; in the other all were sown in the spring. Regular determinations were made of leaf-catalase activity and moisture content. Catalase activity in the autumn-sown experiment declined to a minimum during the winter months, rose to a spring maximum and thereafter declined. In the spring-sown experiment, catalase activity rose to a maximum in mid-April, declined to a minimum in early May, ascended to a second maximum at the end of May and then declined again. In the autumn-sown experiment, the spring varieties had the higher catalase activity; in the spring-sown experiment, the spring varieties had a higher activity from May onwards only. Moisture content, in general, followed the same pattern as catalase activity. The decline in moisture content during June in the spring-sown experiment was, however, much more pronounced in the spring varieties.

4057 PILET, P.-E. & STROUN, M.
Étude physiologique et biochimique (auxines-oxydases) de la "greffe embryonnaire" du *Triticum vulgare* Host. **[A physiological and biochemical (auxin-oxidase) study of embryonic grafting of *T. vulgare* Host.].**
Rev. gén. Bot. 1958 : **65** : 244–78.

After a brief review of some recent papers on vegetative hybridization with embryos, experiments are described in which embryos of two wheat varieties, Lichti 1 and Probus, were removed from the grain and then either replaced on their own endosperm or that of the other variety. Roots of Lichti 1 seedlings are normally longer than those of Probus seedlings of the same age but the Probus seedlings are heavier; these relationships were maintained when embryos were grafted on to endosperm of the same variety. In the grafts the endosperm had a dominating influence on root length and weight; for example, the roots of Lichti 1 seedlings which had been grafted on to Probus endosperm, grew more slowly than the roots of those replaced on Lichti 1 endosperm. It is not known how the endosperm influences growth processes; the auxin-oxidizing enzymes of the Lichti 1 roots were more active than those of the Probus roots.

4058 SÍVORI, E. M.
Época de siembra y período vegetativo del trigo. **(Sowing time and vegetative period in wheat).**
Rev. argent. Agron. 1957 : **24** : 144–56.

Experiments on the reactions of different wheats to various sowing times at General Pico, Argentina, indicated that Kanred is a winter wheat with a definite thermophase and that San Martín and 38MA are spring wheats without marked thermophase or photophase; Lin Calel, which has a long vegetative period when sown early and a short one when sown late, is regarded as having stringent long-day requirements during its photophase but no pronounced thermophase. This type of wheat is regarded as particularly suited to the River Plate area where sowing is liable to interruption or delay due to climatic conditions. It is suggested that such wheats may be selected on the basis of their behaviour when sown at different times compared with that of Kanred, San Martín and Lin Calel.

4059 SEGEŤA, V., TELTSCHEROVÁ, L. & BAREŠ, I.
K otázce možnosti výsevu některých ozimých odrůd pšenice na jaře. **(The question of the possibility of sowing some winter wheat varieties in spring).**
Věd Práce výzk. Ústav. rostlin. Výrob. 1957 : **3** : 97–110.

Moravian winter wheats, such as Chlumec 12, with vernalization periods not exceeding 18 days, developed normally when sown as spring crops; they ripened at the same time as late spring varieties and outyielded the spring standards though showing reduction in 1000-grain weight and impairment in baking quality. The varieties showed significant differences with regard to the last two properties, even when sown at unusual dates.

4060 Huang, H.-C., Chou, Y.-S. & Ku, M.-M.
(Preliminary report on studies of phasic development in Canton wheats).
Chi-wu-hsueh Pao/Act. bot. sin. 1957 : **6** : 245–58. [Chinese].

Differences in the phasic requirements of four Chinese varieties are described.

4061 Kiričenko, F. G.
(Open intervarietal crossing of winter wheat as a seed-production method).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 10 : 15–21. [Russian].

Hybrid progenies from restricted intervarietal open pollination of Odessa 3, Odessa 12 and Odessa 16 showed slight improvements in yield by comparison with the pure variety. No appreciable changes were observed with regard to hardiness, grain quality or baking quality. The progenies from open pollination with winter-hardy varieties however were somewhat hardier than those from pollination with moderately or less hardy varieties.

4062 Oksijuk, P. F. & Hudjak, M. I.
(So-called somatic fertilization in wheat).
Ukrajin. bot. Ž. (Ukrain. bot. J.) 1957 : **14** : No. 4 : 71–77. [Ukrainian].

Experiments by Afanas'eva [XXVII, 1605] suggesting that somatic fertilization occurs in wheat are criticized. It is thought that Afanas'eva has mistaken aborted nucellar nuclei for sperms and ovarian tissues, modified in appearance by mechanical injury, for pollen tubes.

4063 Lawrence, J. M., Day, K. M., Huey, E. & Lee, B.
Lysine content of wheat varieties, species, and related genera.
Cereal Chem. 1958 : **35** : 169–78.

The large number of varieties of *Triticum vulgare* analysed ranged from 2·46 to 3·84% with respect to the proportion of lysine in the total protein of the kernel. Over-all means for spring and winter wheat were respectively 2·91 and 3·15%. No significant differences were found between white spring, red spring and winter wheats in lysine content. The over-all mean lysine content was 2·89 ± 0·21% for wheats with a protein content of over 13·5%. Above 13·5% protein, no correlation existed between protein content and proportion of lysine but below this percentage a highly significant inverse linear relationship was detected. Lysine content was not affected by season and locality, except in so far as these factors influenced protein content. The mean percentages of lysine in other samples were: 2·97 for six varieties of *T. durum*; 3·00 for other species of *Triticum*; 3·30 for genera related to wheat; and 3·10 for selections from crosses of *Agropyron elongatum* with wheat. The possibility of breeding for higher content of lysine is considered.

4064 Malato-Beliz, J. & Baptista, J. G.
Sobre a determinação da característica "densidade" em espigas de trigo. **(The determination of the character density in wheat ears).**
Melhoramento 1957 : **10** : 33–46.

Various criteria of density that have been used in the literature are reviewed. Investigations of seven wheat cultivars showed that the criterion based on the mean length of the internodes in the central third of the rachis gave results less subject to variation than the criterion based on length of spike divided by number of spikelets. This is due to the fact that the coefficient of variation was greater for number of spikelets than for spike length. However, even when the density is calculated on length alone the variability is such that the character is not a reliable feature for use in classifying botanical varieties within the species, or even for distinguishing cultivars except in extreme cases.

4065 Pohlendt, G.
Anatomische Untersuchungen über die Brüchigkeit der hexaploiden Weizen unter Berücksichtigung der iranischen Spelzfunde. **(Anatomical investigations of the brittleness of the hexaploid wheats with regard to the Iranian finds of spelt).**
Z. Pflanzenz. 1958 : **39** : 339–47.

Detailed accounts are presented of the tissues responsible for brittleness of the ear of *Triticum spelta* Zuzger Weisskorn [Zuzger White grain], *T. macha* from a Turkish source and *T. aestivum* 'Heine VII'. Slight differences in these tissues were found between Zuzger Weisskorn and some of the samples of *T. spelta* collected by Kuckuck in Iran [cf. XXVIII, 1509]; other samples showed complete resemblance to the Swiss spelt as regards brittleness.

4066 Wright, G. M.
Grain in the glume of wheat.
Nature, Lond. 1958 : **181** : 1812–13.

Development of flower parts in the axil of the second glume has been found to occur regularly in a fully-awned, compactoid line of wheat at the Department of Scientific and Industrial Research, Christchurch, NZ. This development ranges from a rudimentary palea to a complete flower which may set a grain. The terminal spikelets in all the ears are incompletely developed. The line originated from a cross between two awned varieties, S357 from Crete and S1556 from India. The awned progeny of a subcompactoid F_2 plant consisted of 27 compactoids, 43 subcompactoids and 32 normal plants. An F_5 raised from three compactoid F_4 individuals consisted of compactoids ($2n = 44$), The material is thus presumably a stable tetrasome IX compactoid. In the F_3, the abnormality was observed in compactoids and in the compact part of a subcompactoid ear but not in a normal ear. The abnormality has not been found in *Triticum compactum*, and in F_1 ears of the cross of the line with *T. compactum* as ♂ only the upper spikelets had flower parts in the glumes. The irregularity is thus closely related to compactoidy, and appears, like compactoidy, to be independent of the *T. compactum* factor. A duplication compactoid found recently in unrelated material had relatively short glumes and no awns. In the one ear harvested 11 of the 16 spikelets had flower parts in the second glume. It is suspected that the abnormality had not been recorded previously because the effect is not conspicuous unless a grain is formed, and if a grain is formed the impression is given that the glume has been broken off. Okamoto has recently reported that chromosome IX belongs to genome A [269]. The significance of speltoids and compactoids in elucidating the evolution of wheat is briefly assessed with reference to this finding by Okamoto and work by other investigators.

4067 Szőke, S., Gruzl, F. & Rajkai, P.
A magyar búzafajták lisztminőségének vizsgálata az 1953–54–ös években. (**Investigation on the flour quality of Hungarian wheat varieties in the years 1953–55**).
Növénytermelés 1957 : **6** : 289–302.

Data on the gluten content and laborograph and farinograph values of the flour are given for a number of varieties, chiefly Bétabánkút, Bánkút 1201 and Fleischmann 481, tested in different years and different localities.

4068 de Leo, T. & Castaldi, M. L.
Ricerche sui componenti dell'amido del *Triticum vulgare* e del *Triticum durum.* Nota III.—La capacità di legare lo iodio dell'amilosio proveniente dai grani teneri e dai grani duri. (**Researches on the components of the starch of *T. vulgare* and *T. durum.* Note III. The iodine-binding capacity of the amylose from soft and hard wheats**).
Ric. sci. 1957 : **27** : 3605–13.

The above characteristic was determined for 3 varieties of *T. durum* and 5 of *T. vulgare.* Intraspecific variation was very slight.

4069 Fernandes, S. J. G. & Tavares, M. M. S. V. S.
Aminoácidos indispensáveis em algumas formas cultivadas de trigo. (**Essential aminoacids in some cultivated forms of wheat**).
Melhoramento 1957 : **10** : 23–32.

Analyses of seven wheat varieties showed Lobeiro to have the highest total content of aminoacids whilst the best combination of biologically valuable aminoacids occurred in Mocho de Espiga Branca [White-eared Mocho], which in spite of a low total protein content had the highest content of lysine.

4070 Loisil, L.
La qualité des blés de la récolte 1955. (**Quality of wheats from the 1955 harvest**).
Terre maroc. 1956 : No. 319 : 3–8.

Tabulated data are provided on the technological properties of a series of wheat varieties grown in various regions of Morocco. Of the soft wheats, the variety 2.511 had the best quality; two promising new varieties are 3.221 and 3.106. Amongst the hard wheats, 272 and 2.777 gave on the whole the best results.

4071 Pool, M. & Patterson, F. L.
Moisture relations in soft red winter wheats. 1. Varietal differences and delayed harvest effects.
Agron. J. 1958 : **50** : 153–57.

Four varieties of soft red winter wheat differed in the rate at which their grains dried to a moisture content of 14% in the field after rain or dew. Rate of drying in the laboratory at 27–30° C. and rate of moisture absorption in a humidity chamber increased with delay in harvesting and were related to changes in kernel structure. Varietal differences were detected in the rate of change of absorption properties during the period of delayed harvest.

4072 Pool, M. & Patterson, F. L.
Moisture relations in soft red winter wheats. II. Awned versus awnless and waxy versus nonwaxy glumes.
Agron. J. 1958 : **50** : 158–60.

The results of field and laboratory investigations on near-isogenic lines indicated that awnedness and nonwaxy glumes were more conducive to drying of the grain than the awnless condition and waxy glumes. The first-mentioned characters should therefore receive attention in breeding varieties for the humid soft-wheat growing area of the USA [cf. XXVII, 2806].

4073 Shellenberger, J. A., Shogren, M. & Laude, H. H.
Microtechnics applied to wheat quality evaluation.
Agron. J. 1958 : **50** : 151–53.

Microtechniques have been devised by means of which information on the following may be gained from samples of 100 g. or less: protein, moisture and ash contents of the wheat and flour, flour yield, farinograph absorption, MTI (mixing tolerance index), mixing time and loaf volume. With loaf volume as the criterion of strength, the correlation between the volumes obtained by the standard baking procedure and microtechnique was 0·86. Use of the microbaking test for screening for strength at an early stage in breeding is therefore justified.

4074 Jannaccone, A.
I frumenti duri nel mezzogiorno d'Italia. (**Hard wheats in southern Italy**).
Ital. agric. 1958 : **95** : 239–50.

The average yield of grain during the last three years in southern Italy has been 11·56 c. per ha. for *Triticum durum* as compared with 20·82 c. from bread wheats. A study of the cultivation of *T. durum* in the southern provinces and in Sicily and Sardinia shows that the old varieties, particularly Cappelli, Timilia and Garigliano, are still predominantly grown, since none of the cultivars recently bred has excelled them in fertility and earliness. It has been shown that these old varieties, particularly Cappelli, are far from pure and by a combination of selection and improved husbandry yields of 30–40 c. per ha. have been obtained from them.

4075 Harada, K. & Hisayasu, Y.
(**Experiments on the cultivation of cereals sown between rice rows**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1956 : No. 55 : 23–34. [Japanese].

Comparative data on the performance of 10 wheat varieties after sowing (1) between rice rows and (2) on bare ground are given. Varieties with high numbers of spikes per plant and grains per spike did best after intersowing with rice.

4076 Robin, M.
Les effets du froid de l'hiver 1955–1956 sur quatre variétés de blé. (**The effects of cold in the winter 1955–56 on four wheat varieties**).
Ann. Éc. nat. supér. agron., Toulouse 1957 : **5** : 17–28.

Four varieties of wheat were sown at various dates in autumn and winter and their reaction to low temperatures in the following February was observed. Susceptibility to cold was directly related to the degree of vegetative development. Marked varietal differences in resistance were only found amongst those plants sown at the beginning of December, Étoile de Choisy [Choisy Star] being the most resistant. Amongst plants sown on 19 December, Inalettabile 8 [Nonlodging 8] was slightly more resistant than Étoile de Choisy and Vilmorin 27, whereas with earlier sowing dates Inalettabile 8 had been the least resistant of these three varieties.

4077 Luk'janenko, P. P.
(**The principal results of breeding work with winter wheats**).
Dokl. Vsesojuzn. Akad. seljskohozjajstv. Nauk Lenin (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 11 : 6–12. [Russian].

This report on wheat breeding at Krasnodar gives descriptions of Novoukrainka 84, Skorospelka 3b [Early 3b] and Bezostaja 4/1 [Awnless 4/1] [cf. XXVI, 2239]. Kuban' 60 (Novoukrainka 84 x Odessa 3) has reached an advanced trial stage. Early trials indicated that it is more productive than its parents and combines the milling and baking properties of Novoukrainka 84 with the hardiness of Odessa 3. Other new hybrid wheats almost ready for trials include high quality bread wheats with a yield 25–30% higher than Bezostaja 4/1 and resistant to various races of *Puccinia*.

4078 Ozol, A. M.
(**The successes of Soviet biological and agricultural sciences over 40 years**).
Latv. PSR Zinät. Akad. Vestis. 1957 : **10** : 129–37. [Russian].

Mention is made of high-yielding varieties of cereals bred in Latvia, in particular the lodging-resistant wheat Kursas from the Stend Breeding station.

4079 Innamorati, M.
Vernalizzazione e "tenerizzazione" nel *Triticum durum*, Desf. (**Vernalization and mealy endosperm in *T. durum***).
Ric. sci. 1957 : **27** : 2711–26.

The incidence of mealy endosperm and heading date of plants grown from (*a*) normal hard grains or (*b*) mealy grains of the varieties Bidì, Cappelli and Amharai Zellim Cerù sown at monthly intervals from October to March were determined. In the case of the first two varieties, which are winter forms, the offspring from the mealy grains include forms with an extended vegetative period. This effect was not observed with the third variety, a short-cycle form from Eritrea.

4080 Lange - de la Camp, M.
Helminthosporium sativum in Mittel- und Norddeutschland. (***H. sativum* in Central and North Germany**).
Phytopath. Z. 1958 : **32** : 167–80.

Six spring wheats and six spring barleys were tested with five cultures of *H. sativum* (*Cochliobolus sativus*) of different origin; the investigation was carried out in a glasshouse. The five races of *H. sativum* differed markedly in their effects on different hosts; a race designated H93 was the most virulent on both wheat and barley. With the exception of the wheat Peko, whose reaction needs further investigation, all the varieties tested were susceptible to *H. sativum.* Details are given of the occurrence of *H. sativum* in various parts of Central and North Germany and of the symptoms of the disease.

4081 Király, Z. & Lelley, J.
A búza túlérzékenységi reakciója a porüszögfertőzés hatására. (**On the hypersensitive reaction of wheat to the effect of infection with loose smut**).
Növénytermelés 1957 : **6** : 233–38.

Artificial inoculation of six Hungarian wheats with *Ustilago tritici* resulted in depression of growth of some plants in each variety. Depressed plants never had smutted heads but about half of them contained pathogenic hyphae which had not reached the top node. Of the plants with normal growth some had smutted heads and those which had not were entirely free from the pathogen. Almost all the plants of Hatvani 37/1 and Mindenes [Factotum] were of the stunted type resulting from the hypersensitive reaction.

4082 Schafer, J. F., Caldwell, R. M., Compton, L. E. & Patterson, F. L.
Loose smut reactions of some winter wheat introductions.
Plant Dis. Reptr. 1958 : **42** : 524–28.

A series of wheats of foreign origin were tested for resistance to *Ustilago tritici* at Lafayette, Ind. Two Portuguese varieties were most promising, PI191733 (Richelle) and PI191749 (Rieti); these showed resistance to smut strains pathogenic to varieties with the Trumbull type of resistance.

4083 Walkden Brown, C.
Wheat varieties for 1958.
Agric. Gaz. NSW 1958 : **69** : 57–68.

Notes describing varieties recommended for commercial and trial sowing in New South Wales are provided. The wheats for trial include Koda (Kendee x Gabo), recently released as a flag-smut resistant substitute for Gabo in areas where this disease is a problem. Koda closely resembles Gabo in time of ripening and reaction to stem rust but, although better in grain finish, it has so far proved less productive.

4084 Batts, C. C. V. & Jeater, A.
The reaction of wheat varieties to loose smut as determined by embryo, seedling, and adult plant tests.
Ann. appl. Biol. 1958 : **46** : 23–29.

Ears of 57 wheat varieties were inoculated with races C_2 and C_3 of *Ustilago tritici*. Ten varieties had embryos resistant to one or other race and Braun R and Molinel were almost immune. In susceptible varieties, the percentage infection of the embryos indicated how many plants would be infected in the following crop. Many field-resistant varieties also had susceptible embryos; in these cases, the mycelium was unable to proceed beyond the scutellum and the growing point was not infected. Embryo tests are therefore of no use for forecasting the field reaction of these varieties.

4085 Alghisi, P.
Suscettibilità alla "carie" (*Tilletia* spp.) di varietà di frumento coltivate nella regione veneta. [**Susceptibility to smut (*Tilletia* spp.) of wheat varieties grown in the Veneto region**].
Agricoltura d. Venezie 1958 : **12** : 139–48.

Data are presented showing the degree of attack of 16 varieties grown in the vicinity of Padua after artificial infection with an inoculum comprising the main biotypes of this region of northern Italy. Fiorello showed significantly lower infection percentages than all other varieties, Mentana being the most susceptible.

4086 El Khishen, A. A. [Khishin, ʻA. ʻA.] & Selim, A. K.

Inheritance of resistance to stem rust *Puccinia graminis tritici* (Eriks. and Henn.) and the awned character in wheat crosses.

Alexandria J. agric. Res. 1958 : **6** : No. 1 : 99–129.

In investigations at the Faculty of Agriculture, University of Alexandria, inheritance of field reaction to stem rust was studied in 18 crosses representing (1) resistant x susceptible, (2) resistant x resistant and (3) susceptible x susceptible combinations. Group (1) comprised Thatcher x Ramona, Thatcher x Baart, Thatcher x White Federation, line 119–1–2–2 (Thatcher x Hindi D) x Kenya Standard, line 8–5 (Thatcher x Ramona) x BIPM, *Triticum pyramidale* 'Baladi 116' [Local 116] x *T. durum* 'GBIM462', Newthatch-Frontana 406 x Hindi D and Newthatch-Frontana 407 x Hindi 62. In each of these crosses resistance depended upon a single gene, partially dominant in the first six and dominant in the last two. In each of the two crosses in group (2), line 119–1–2–2 x Kenya 117A and Baladi 116 x *T. durum* 'Stewart', the F_2 segregated into resistant and susceptible plants in a 15 : 1 ratio, indicating that the parents carried different dominant genes for resistance. Group (3) consisted of Ramona x Hindi D, Tosson x Hindi D, Hindi D x Hindi 62, Ramona x Baart, Ramona x Kenya Governor, Tosson x Hindi 62, Hindi D x Kenya Standard and Hindi 62 x Kenya Standard. The parents in the first six crosses carried identical genes for susceptibility. In the last two, F_2 segregation for resistance and susceptibility had a ratio of 1 : 15. It was assumed that Kenya standard was homozygous for one dominant gene for susceptibility and Hindi D or Hindi 62 for another.

Inheritance of awns was analysed in four groups of crosses: (1) apically awnleted x fully awned, (2) apically awnleted x awnless, (3) fully awned x awnless and (4) fully awned x fully awned. Data on the six crosses in (1) indicated that, following the scheme proposed by Watkins and Ellerton [X, 937], the apically awnleted wheats Newthatch-Frontana 406, Newthatch-Frontana 407, Kenya Governor, Kenya Standard, Kenya 117A and line 8–5 had the genotype $B_1B_1b_2b_2$, and the fully-awned varieties Hindi D, Tosson, Mokhtar, Hindi 62, line 119–1–2–2 and BIPM, $b_1b_1b_2b_2$. In the single cross of type (2), Kenya Governor x Ramona, the F_2 segregated in a ratio of 1 awnless: 2 intermediate (short beak): 1 apically awnleted; Ramona may therefore have the constitution $B_1B_1B_2B_2$. In one of the two crosses in (3), Hindi D x Ramona, the F_2 distribution had the dihybrid ratio of 5 awnless : 3 apically awnleted : 4 awnleted : 3 short awned : 1 awnless. In the other cross, Mokhtar x Ramona, the F_2 distribution fitted a dihybrid ratio of 1 awnless : 11 awnleted and apically awnleted : 3 short awned : 1 fully awned. It is postulated that B_1 shortens the awns to a greater extent than B_2. The different F_2 ratios obtained in the two crosses are explained by assuming that Hindi D and Mokhtar, homozygous recessives for b_1 and b_2, contain different modifiers affecting the expression of B_1 and B_2. The parents of the crosses studied in the last group, which consisted of Mokhtar x line 271–14–3–1, Hindi 62 x line 119–23–4–1, Mokhtar x Hindi D, Baladi 116 x GBIM462 and Baladi 116 x Stewart, proved to be genetically similar for the awned condition.

4087 Massenot, M.

Distribution of physiologic races of *Puccinia graminis tritici* isolated up to the present, in Europe and in some countries of the Mediterranean basin.

Robigo, Castelar 1958 : No. 5 : 4–5; also in French, 2–3, and Spanish, 3–4. (Mimeographed).

The list presented shows the countries in which 55 races have so far been isolated. Races 14, 15, 17, 21, 24, 34, 40 and 75 are the most widespread with race 21 increasing and race 14 decreasing since 1950.

4088 Zadoks, J. C.

Preliminary report on the "yellow rust trials project" in 1956 and 1957.

Tech. Ber. Sticht. Ned. Graan-Centrum 1958 : No. 1 : Pp. 21 + 6. (Mimeographed).

The above cooperative project among breeders in several countries in Europe was organized by the Netherlands Grain Centre, Wageningen. The report includes information on the distribution of yellow-rust races and on the reactions of many spring and winter wheat varieties to the pathogen. The races were tentatively assigned to two groups, of which races 2X and 7X are respectively regarded as the type races. Race 2X is found on Capelle and 7X on Heine VII. Regional differences in varietal reaction, apart from those due to the occurrence of different races, have not been apparent.

4089 Batts, C. C. V.
The reaction of wheat varieties to yellow rust, *Puccinia glumarum* 1951–1956.
J. nat. Inst. agric. Bot. 1957 : **8** : 7–18.

Observations on the incidence of yellow rust on 93 varieties in the field in different parts of Great Britain are reported. Thirty-eight varieties had less than 1% infection. Physiological races were identified. Some of the differentials gave uncertain results, Webster in particular being genetically unstable. Race 8 occurred in all parts of the country. A biotype (8a) of this race, notable for its ability to infect Heines VII, a variety hitherto considered to be yellow-rust resistant, was distinguished. A biotype (2a) of race 2 was also identified. Data are given on the reactions of 82 varieties as seedlings and adult plants to races 2b, 5 and 8 in the greenhouse. In inoculating, use was made of a brass cyclone separator attached to a vacuum and compression pump. More varieties were susceptible as seedlings to 2b than to any other race. Glasnevin Rosa, Koga, Minister, Peko and Staring were resistant to all three races in both the seedling and adult-plant stages.

4090 Bocsa, E.
Researches on physiologic specialization of "wheat stem rust" (*Puccinia graminis tritici*, Pers.) in Hungary.
Robigo, Castelar 1958 : No. 5 : 6–7; also in German, 5–6, and Spanish, p. 6. (Mimeographed).

The three races identified among 400 isolates in 1956 were race 21, 76%, race 14, 16% and race 40, 8%.

4091 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Identificazione di razze fisiologiche di *Puccinia rubigo-vera tritici* (Erikss. et Henn.) Carl. (= *P. triticina* Erikss.) isolate da campioni provenienti da varie regioni d'Italia (anni 1953, 1954 e 1955). [**Identification of physiological races of *P. rubigo-vera tritici* (Erikss. et Henn.) Carl. (= *P. triticina* Erikss.), isolated from material collected in various regions of Italy (years 1953, 1954 and 1955)**].
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. ciii–cxiv.

A total of 19 races were found in 1953 and 1954 [cf. XXVI, 342 and XXVII, 2829] and of these three were previously unknown and are provisionally designated R18, R19 and R20. They have now been given the international race numbers 164, 165 and 166, respectively. In 1955 three further races, 167, 168 and 169, were found among a total of 18. Three races had not previously been recorded in Italy and seven were new to Europe.

4092 Basile, R., Leonori-Ossicini, A. & Zitelli, G.
Razze fisiologiche di *Puccinia graminis* var. *tritici* (Erikss. et Henn.) isolate da materiale raccolto in Italia (anni 1953, 1954 e 1955). [**Physiological races of *P. graminis* var. *tritici* (Erikss. et Henn.) isolated from material collected in Italy (years 1953, 1954 and 1955)**].
Boll. Staz. Pat. veg. Roma 1958 : **15** : 5–16.

The races identified in the years under review are here listed under their international numbers. The list for 1953 has already been published [XXVI, 343]; in 1954, 14 races were found of which only four had previously been recorded in Italy. Of the remaining ten races six had been previously reported from other places and four were new altogether. In 1955 two of the 41 races identified were new altogether, 11 were new to Europe and 21 new to Italy.

4093 Moura, J. A. P.
Raças fisiológicas de *Puccinia graminis tritici* Eriks. et Henn. encontradas em Portugal (1951–1953). [**Physiological races of *P. graminis tritici* Eriks. et Henn. found in Portugal (1951–1953)**].
Melhoramento 1957 : **10** : 5–22.

Races 14, 16, 21, 40, 75 and 186 were identified, race 21 being the most frequent. Khapli proved resistant to all races.

4094 Overlaet, J.
Onderzoek naar de oorzaak der geleroestepidemieen op tarwe [*Puccinia glumarum* (Schmidt) Erikss. en Henn.] in de maritieme polders tijdens de jaren 1954 tot en met 1957. (**Investigation on the cause of the yellow-rust epidemics on wheat [*P. glumarum* (Schmidt) Erikss. and Henn.] in the maritime polders during the years 1954 to 1957 inclusive**).
Agricultura, Louvain 1958 : **6** : 353–78.

In comparisons of race 7X, a new race appearing on the previously resistant variety Heine's VII in Belgium and the Netherlands in 1955, and forms which began to attack the otherwise resistant wheats Alba and Leda in 1957, it was found that both the latter varieties are resistant to 7X, and that isolates from Leda and Alba attack both these varieties but not Heine's VII. Leda was attacked only in the juvenile stage. Although inoculation tests were not detailed enough to demonstrate a physiological difference between the Leda and Alba isolates, it was noted that the Leda form sporulated readily while the Alba type was difficult to maintain.

4095 Papavizas, G. C.
Physiologic races of stem rust of wheat in Greece in 1953 and 1954 and their pathogenicity on Greek wheat varieties.
Ann. Inst. phytopath. Benaki : New Ser. : 1957 : **1** : 103–14.

Races 14 and 21 of *Puccinia graminis* f. sp. *tritici* were found to comprise 59% of 41 isolates from 33 uredial collections. Other races found were 11, 17, 34, 40, 75 and a biotype of race 14. The seedling reactions of 26 American, Italian and Greek varieties to 13 races of stem rust, including those prevalent in Greece, were investigated. Varieties derived from a cross between Rieti and Quality wheats were susceptible to races 17, 21, 34 and 75. Several lines derived from Kenya and line 57826 of the cross (Canberra x Grinias) x Sel. Mentana were resistant to all the races used with the exception of 15B. Only two lines showed some resistance to race 15B. For some varieties, temperature changes had no significant effects on the reaction to race 15B but for other varieties the reactions changed from resistant to susceptible when the temperature was increased from 18° C. to 28° C.

4096 Volosky de Hernandez, D.
Two Chilean wheat varieties that make easy the determination of physiologic races of *Puccinia graminis tritici*.
Robigo, Castelar 1958 : No. 5 : p. 14; also in Spanish, p. 13. (Mimeographed).

It has been found that Mentafen (Mentana x Thatcher) gives a type 4 reaction to race 29 of this pathogen and is of value as a differential variety. Millafen is resistant to races 14, 15B, 17 and 29 in Chile but susceptible to race 11 and may be used for its determination and isolation.

4097 Postigo, R.
Physiologic specialization of *P. graminis* var. *tritici*, *P. rubigo-vera* var. *tritici*, *P. glumarum* var. *avenae*, *P. graminis* var. *avenae* and *P. coronata* var. *avenae* in Peru in 1956.
Robigo, Castelar 1958 : No. 5 : 12–13; also in Spanish, 11–12. (Mimeographed).

About 45% of the total isolates of *P. graminis* var. *tritici* were of race 15B. Altogether 19 races were described, of which four were new. In the case of *P. rubigo-vera* var. *tritici*, 16 races were identified, with race 61 accounting for 33% of the total and seven of the races being new, while 11 races of *P. glumarum* were found. Only four races of *P. graminis* var. *avenae* occurred, with race 6 predominant, totalling 58% of the isolates and race 4 accounting for a further 28%. In the case of *P. coronata* var. *avenae*, 18 races were identified, six of which were new. Race 224 accounted for 44% of the total.

4098 Rojas M., E.
Occurrence of wheat stem rust race 29.
Plant Prot. Bull. 1958 : **6** : 105–06.

Race 29 has been recorded for the first time in Peru. Attention is drawn to disparities in the reactions of five wheat varieties to this race in four different countries. Kenya B286 is resistant in the USA (St. Paul, Minn.), Mexico, Canada and Peru. Kenya 117A is susceptible only in the USA and Lerma Rojo only in Peru, while Bowie and Kenya 58 are both susceptible in all four countries.

4099 Rojas M., E.
Raza 29 de *Puccinia graminis tritici* Ericks y Henn (roya negra del trigo) en el Perú. [**Race 29 of *P. graminis tritici* Ericks. and Henn. (black rust of wheat) in Peru**].
Inf. mens. Estac. exp. agríc. La Molina 1957 : **31** : No. 363 : 1–4. (Mimeographed).

The Peruvian form of race 29, found in 1956, differs from biotypes found in the USA, Mexico and Canada in degree of pathogenicity on Bowie, Lerma Rojo [Red Lerma] and the Kenya lines 58, 117A and B286. Sources of resistance are listed.

4100 Rojas Mendoza, E.
Race 29 of *Puccinia graminis tritici* Eriks and Henn (wheat stem rust) in Peru.
Robigo, Castelar 1958 : No. 5 : 8–10; also in Spanish, 7–8. (Mimeographed).

This race appeared in Peru in 1956 but shows some differences in pathogenicity as compared with isolates, also placed in race 29, from Minnesota, Mexico and Canada. The reactions of 19 varieties and selections, including some possible sources of resistance, are tabulated.

4101 Green, G. J. & Johnson, T.
Further evidence of resistance in *Berberis vulgaris* to race 15B of *Puccinia graminis* f. sp. *tritici*.
Canad. J. Bot. 1958 : **36** : 351–55.

Inoculation of plants of *B. vulgaris* in Manitoba with two cultures of race 15B–4(Can) resulted in the development of resistant type infections; similar results were obtained when barberry plants were inoculated with sporidia from teleutospores produced in the field on varieties selective for race 15B. Barberry plants did not show comparable resistance to rusts derived from hosts nonselective for race 15B. It is thought probable that mutations in respect of avirulence to barberry have occurred in race 15B and the race now consists of the descendants of the mutant forms. When barberry was inoculated with race 29 or race 48A both resistant and susceptible types of infection occurred.

4102 Aslam, M. & Ausemus, E. R.
Genes for stem rust resistance in Kenya farmer wheat.
Agron. J. 1958 : **50** : 218–22.

Kenya Farmer was crossed with 11 other spring wheats, Kenya 58, Kenya 117A, Egypt Na101, Egypt Na95, Timstein-Henry, Kentana, Thatcher, Lee, Lerma, Mida and Marquis. A number of other crosses among some of these 11 varieties were also effected. Kenya Farmer carried a dominant gene for field resistance to a collection of races, while Kenya 58 and 117A and Egypt Na95 carried two other genes which, when dominant, exerted a complementary control of resistance. Data on seedling reactions to race 15B could be interpreted by assuming that Kenya Farmer possessed one dominant gene for resistance, Kenya 58 and Kenya 117A two other dominant genes for resistance, Lee, Mida and Thatcher two dominant genes for susceptibility and Timstein-Henry one of the last-mentioned genes. The two genes for susceptibility appeared to be epistatic to those for resistance. All five genes were inherited independently and those for resistance had an additive effect. The recessive alleles of the two genes for susceptibility resulted in the type of resistance possessed by Lerma. Seedling reactions to races 38 and 11 were attributable to the interaction of three independent and dominant genes for resistance and one gene for susceptibility, genes for resistance being epistatic to the factor for susceptibility. Kenya Farmer carried one of the dominant genes for resistance. No association was found between F_2 reaction in the field and F_3 seedling reaction to 15B, except in Timstein-Henry x Kenya Farmer and Mida x Kenya 117A. F_3 seedling reactions to races 11 and 38 were associated in the two crosses (Kenya 58 x Kenya Farmer and Thatcher x Kenya Farmer) analysed for the possibility of such an association.

4103 Aslam, C. M.
Relationship of genes for rust resistance in vulgare wheat varieties.
Diss. Abstr. 1957 : **17** : Publ. No. 18,917 : 2368–69. (Abst.).

A detailed account of the investigations on stem-rust resistance has appeared elsewhere [4102]. The following results of additional work are also given.

Lee and Kenya Farmer showed resistance to leaf rust while the remainder of the varieties were susceptible. The results of all crosses with Kenya Farmer, except that involving Thatcher, were explicable on a monofactorial basis, with susceptibility dominant. Data on Thatcher x Kenya Farmer indicated that the former wheat carried genes for susceptibility in addition to a gene for resistance. The genes for susceptibility had an epistatic effect on those for resistance in this cross.

The nonwaxiness of Egypt NA95 was controlled by one locus. Earliness of heading was multifactorially inherited.

4104 Farkas, G. & Király, Z.
A rozsdafertőzés hatása a búzalevelek glikolsavoxidázának aktivitására. (**The effect of rust infection on the glycolic acid oxidase activity of wheat leaves**).
Növénytermelés 1957 : **6** : 131–34.

Respiration rate increased and glycolic acid oxidase activity decreased in wheat seedlings inoculated with *Puccinia graminis* var. *tritici*, race 21, the susceptible varieties *Triticum aestivum* 'F481' and 'R23' showing greater response to infection than the resistant forms *T. timopheevi*, *T. monococcum* and *T. dicoccum* 'Vernal'.

4105 Emge, R. G. & Bromfield, K. R.
The use of controlled temperature and selected hosts to differentiate between two cultures of wheat stem rust.
Plant Dis. Reptr. 1958 : **42** : 360–62.

Difficulty has been experienced in differentiating between certain isolates of races 17 and 29 of *Puccinia graminis* var. *tritici*. In general it has been observed that at 70° F. or lower temperatures mesothetic reactions are obtained on the durum wheats in the standard series of 12 differentials; the isolates would therefore be assigned to race 29. At about 80° F. the isolates incite pustules of the susceptible type of reaction on the durum differentials and would thus be classified as race 17. In tests of 26 additional wheats as possible differentials, Bowie, Mayo 52, McMurachy, Selkirk and South Africa 50 reacted differentially to the two races but only at 70°–75° F. Bowie gave the most marked differential reaction, especially at 70° F.

4106 BROMFIELD, K. R. & EMGE, R. G.
The effect of DDT on the rust reaction of several wheat varieties to wheat stem rust.
Plant Dis. Reptr. 1958 : **42** : 354–59.

Tests of the effect of DDT on resistance to stem-rust race 56 were carried out on 113 varieties which are normally resistant to this race at or below 70° F. None of the 98 varieties of *Triticum vulgare* lost their resistance. Seven out of the 13 *T. durum* wheats tested and *T. dicoccum* 'Khapli' became susceptible. A Chinese-*Agropyron elongatum* selection maintained its resistance. Five of the DDT-sensitive durum wheats (Egypto 2100, Recio de Toledo, Tremez Molle, Tremez Preto and Tremez Rijo) were introduced into the USA from the Iberian peninsula while the other two (Beladi 116 [local 116] and St. 464) originated from north-east Africa. It is possible that the varieties within each group are closely related; the two groups may even have been derived from the same source.

4107 SANTIAGO, J. C.
The effect of mutagenic agents on a single-spore isolate of race 21 of *Puccinia graminis tritici.*
Melhoramento 1957 : **10** : 47–66.

After reviewing the literature on mutation in *Puccinia*, experiments are described in which large numbers of uredospores of race 21 of *P. graminis* var. *tritici* were treated with various mutagenic agents. Uredospores were exposed to ultraviolet light, colchicine solutions of different strengths or a temperature of — 23·3°C. for various periods of time; in each case no mutant forms could be detected when the surviving spores were inoculated on stem-rust differential wheat varieties. Similarly no mutants were found when uredospores were inoculated on plants which were treated with colchicine either before or after inoculation or on plants kept at 95° F. or 105° F.
It is therefore concluded that the fungus has a relatively low rate of mutation. Suggestions are made for modifying the above experiments so that more success may be had in inducing mutation.

4108 GENEL, M. R.
Studies on resistance of wheat varieties to weevil attack.
Diss. Abstr. 1957 : **17** : Publ. No. 22,207 : 2357–58. (Abst.).

Varietal differences were found in total loss in weight of stored kernels as the result of weevil attack. Vigo, Turkey and Dual were noteworthy for resistance.

4109 PAVLOV, I. F.
(The resistance of hard wheat to Hessian fly).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 66–67. [Russian].

Data on resistance of spring wheats to Hessian fly at the Dokučaev Agricultural Institute are presented. Among the hard wheats, Melanopus 69 and Hordeiforme 10 showed the highest degree of resistance, even when grown under conditions of heavy infestation for a number of years. These and other experiments, where resistant varieties were grown in a field surrounded by heavily infested soft wheats, indicated that no biotypes of the insect better adapted to attacking hard wheats evolved. Moreover the growing of hard wheat appeared to reduce the degree of infestation among the soft wheats.

4110 SILL, W. H. (JUN.) & KING, C. L.
The 1957 soil-borne wheat mosaic epiphytotic in Kansas.
Plant Dis. Reptr. 1958 : **42** : 513–16.

Information is provided on the performance of several wheats on soils infested with wheat mosaic virus in eastern Kansas; in general Concho and Comanche gave the highest yields on such soils.

4111 BORSA, P.
Sensibilità delle razze di frumento a prodotti diserbanti e anomalie osservate.
(Sensitivity of wheat varieties to herbicides and the anomalies observed).
Ann. Fac. Agr., Milano 1955 : **4** : 213–18.

Tests of 16 varieties with MCPA and various compounds of 2,4-D showed that although no variety was immune from injury, some were less susceptible than others. All but Fiorello and San Giorgio were less damaged by the sodium salt of 2,4–D than by the ethyl ester. Four varieties were highly susceptible to this ester and four to the butoxyglycolic ester but only two varieties, R37 and Mara, were common to these two groups. Villa Glori, Tevere and Giuliari were resistant to both the sodium salt and the butoxyglycolic ester.

4112 Weibel, D. E.
Vernalization of immature winter wheat embryos.
Agron. J. 1958 : **50** : 267–70.

Embryos of Comanche wheat, an obligate winter variety, were successfully vernalized by gathering spikes 8 to 12 days after anthesis, standing the spikes in water and storing them at 32–40° F. for 40–50 days. A long photoperiod was necessary to produce heading in plants grown from seed vernalized in this way. The technique described may be useful in breeding, for it enables more than one generation of a winter crop to be grown in a year.

4113 Price, C. D. & Klingman, G. C.
Wheat and oats varietal responses to applications of alkanolamine salt of 2,4–D.
Agron. J. 1958 : **50** : 200–04.

Experiments on 27 winter wheats and 29 winter oats at the North Carolina State College revealed varietal differences in response to the amine salt of 2,4–D, as indicated by data on height of the mature plants and yield. These differences were particularly noticeable in wheat when the herbicide was applied at the rate of 2 lb. per acre at the stage of early tillering, and in oats when the same amount was applied at the fully tillered stage. It is suggested that selection for tolerance of the herbicide is possible.

4114 Villax, E. J.
Le comportement de nos triticales anciens et la production des triticales neufs en masse. (**The behaviour of our old *Triticales* and the production of new *Triticales* in bulk**).
Melhoramento 1957 : **10** : 67–80.

The first *Triticale* to be produced at Elvas was S. José, obtained by colchicine treatment of an Ardito x Petkus hybrid; it had the genome AABBDDSS. For two years S. José behaved as a complete homozygote and then segregation into different types occurred. It was possible to distinguish lines of S. José differing markedly in morphological and physiological characters, including resistance to *Puccinia graminis* and *Claviceps purpurea*. S. José was grown under conditions which rendered hybridization with other *Triticale* or wheat varieties most likely. The segregation observed might therefore be due to either a strong tendency towards allogamy or a reduction in chromosome number. The second *Triticale* produced at Elvas came from a cross between Ardito and Centeio do Alto [Highland rye]; this form was sterile. Some information is also provided on a series of wheat x rye hybrids produced during 1955–56. Compatibility between wheat and rye was influenced by the structure of the wheat flower, the crosses being more successful when emasculation could be effected without damage to the glumes. It was not found difficult to produce *Triticale* forms provided large numbers of crosses were made. Roots from plants in the tillering stage were soaked in 0·05% colchicine solution for 7–14 hours every day for four days.

4115 **Short wheat with tall yields expected.**
What's New Crops Soils 1958 : **10** : No. 6 : p. 22.

At Pullman, Wash., dwarf wheat selections, two to three feet tall, have yielded 100 to 136 bushels per acre, as compared with 61 to 85 bushels produced by the standard varieties, and have shown no lodging under conditions in which Omar and Elmar lodged severely. Their grain protein content is not high, however, and it is feared that their lower denser growth may encourage the spread of fungous diseases.

4116 Kihara, H.
Completion of genome-analysis of three 6x species of *Aegilops*.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 11.

The study first reported in 1954 [XXVI, 2206] has been completed. The genome types of three 6*x* species have been determined as: *Ae. triaristata* $C^uM^tM^{t2}$, *Ae. crassa* DD^2M^{cr} and *Ae. juvenalis* DC^uM^j and a table is presented showing the genome types of the 21 species of the genus.

4117 Kihara, H., Yamashita, K. & Tanaka, M.
Variations of *Aegilops squarrosa* strains collected in Pakistan, Afghanistan and Iran.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 12–13.

Variation in respect of 13 characters is tabulated. A larger number of variant forms was collected in Iran then in the other countries and it is considered that Iran, especially the Elburz region, is the centre of diversity for this species.

BUCKWHEAT

4118 Nettevič, Ė. D.
(An experiment on vegetative-sexual hybridization of buckwheat).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 47–50. [Russian].

Hybrid 5 was bred at Orel. It was obtained by selection of productive large-grained plants among the progeny of Bogatyr' [Hero]/*Fagopyrum tataricum* that had been fertilized by mixed pollen of Bogatyr'/*F. tataricum* + tetraploid buckwheat/*F. tataricum* + Chinese buckwheat/*F. tataricum*. The hybrid outyields Bogatyr' by 3·6 c. per ha., has larger grain, is a better gruel variety and is richer in protein.

OATS

4119 Forsøg med havresorter, 1953–56. **(Trials of oat varieties, 1953–56).**
Tidsskr. Planteavl 1958 : **62** : 177–80.

Details of the performance of ten varieties on different soil types in Denmark are presented. Max gave the highest yield on both ordinary and marsh soils.

4120 Bericht over rassenkeuze. **(Report on choice of varieties).**
Zaadbelangen 1958 : **12** : p. 107.

The yields of 28 oat varieties on different types of soil in the Netherlands in trials held since 1946 are reported.

4121 **Winter oats for southern Illinois.**
Circ. Univ. Ill. Coll. Agric. 1957 : No. 784 : Pp. 15.

This circular includes data on varietal yields and reactions to Victoria blight, race 202 of crown rust and other diseases.

4122 Brown, C. M., Endo, R. M. & Pendleton, J. W.
Spring oats in Illinois.
Circ. Univ. Ill. Coll. Agric. 1958 : No. 788 : Pp. 24.

Information is provided on the performance of named spring-oat varieties in several localities in Illinois during 1953–1957. Data are included on varietal reactions to *Septoria* black stem (*Leptosphaeria avenaria*), races 7 and 8 of stem rust, and races 202 and 216 of crown rust.

4123 Åkerberg, E. & Persson, P.-J.
Svalöfs Extra Klockhavre II. **(The Svalöf oat Extra Klock II).**
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 79–84.

This new black oat, derived from a cross between Stormogul II [Great Mongul II] and Extra Klock I and released in 1957, is earlier but lower in yield than the former parent but compares favourably with other varieties. Kernel percentage and straw stiffness are higher than in other black oats. It is suited to central Sweden.

4124 Kugler, W. F., Rath, J. & Kruse, G.
Descripción de variedades de avena cultivadas en Argentina. **(Description of oat varieties grown in Argentina).**
Publ. téc. Estac. exp. Pergamino 1957 : No. 32 : Pp. 49.

Twelve varieties are described, details being given of their morphological and agronomic characters and parentage. A key to the varieties is also given.

4125 **Minhafer oats on certified lists.**
What's New Crops Soils 1958 : **10** : No. **7** : p. 44.

Minhafer has already been described [cf. XXVIII, 353]; it came from a cross of Landhafer x (Bond-Rainbow Hajira-Joanette).

4126 Walkden Brown, C.
Oat varieties for 1958.
Agric. Gaz. NSW 1958 : **69** : 2–8.

Varieties recommended for different regions in New South Wales are described. Information is also given on Fulmark [(Fulghum x Fulghum x Gidgee) x Markton], a new early to midseason variety undergoing final trial. It appears to be especially suitable for the production of grain for fodder in the southern part of the state, where it has generally outyielded Belar by over 20%. Fulmark is unsuitable for milling since it has hard, brittle husks.

4127 Frimmel, G.
Die Bedeutung des Fettgehaltes bei der Beurteilung von Hafererernten. **(The significance of fat content in the evaluation of oat yields).**
Bodenkultur 1958 : **10** : 41–47.

The analysis of varietal trials held at three centres in Austria showed that fat and husk contents are influenced more by the environment than hereditary factors. Negative relationships were found between fat and husk contents and between yield and fat content. Yield and husk content were independent characters.

4128 **Winter oats yield well in New York; not recommended yet.**
What's New Crops Soils 1958 : **10** : No. **7** : p. 27.

It is reported that new selections of winter oats bred at Cornell University outyielded Wintok and Dubois and gave up to 109 bushels per acre. These lines were developed from crosses involving a winter-hardy plant from Ithaca; some of the new selections also showed increased winter hardiness.

4129 GRAFIUS, J. E.
Observations on the lodging resistance formula.
Agron. J. 1958 : **50** : 263–64.

No correlation was found between the cL_r factor [cf. XXV, 252] and lodging in 11 oat varieties; these were then tested for wind resistance. It was found that the moment of force about the base of the culm resulting from the action of the wind on the panicle was a major factor in determining lodging in these varieties. When panicle area is held constant, a correlation coefficient of 0·84 between the cL_r factor and lodging was obtained. It is suggested that, when comparing varieties for lodging, they be grouped according to the coarseness of the panicle and the cL_r readings be compared with check varieties within each class. For 15 winter barleys, the correlation coefficient between lodging and the cL_r factor was 0·72 but when two-row and six-row varieties are being compared, differences in panicle size need to be considered.

4130 GRASSO, V.
Genetica dei carboni dell'avena. Ulteriori indagini sul fenomeno della letalità parziale e totale di una collezione di *Ustilogo kolleri* da Parma. (**Genetics of oat smuts. Further investigations on the phenomenon of partial and total lethality in a collection of *U. kolleri* from Parma).**
Boll. Staz. Pat. veg. Roma 1958 : **15** : 39–61.

Further attempts to grow this isolate in culture have been unsuccessful [cf. XXVI, 970]. It has, however, been crossed with a strain of *U. avenae* from Pullman, Wash., USA, and both the F_1 and F_2 chlamydospores show the lethal type of growth, which ceases after only two or three days. These chlamydospores show an unusual form of germination, producing a long, irregular promycelium; they do, however, cause a high percentage infection when artificially inoculated on to oats.

4131 WAHL, I. [WAHL, Y.] & MENKES, J. [MENKES, Y.]
(Soya, a new oat variety for Israel).
Sadeh (Field)/Hassadeh 1957 : **38** : 28–30. [Hebrew].

A brief account is given of the Israeli oat-breeding programme. Out of more than 150 strains tested, only four were highly resistant to rusts. One of these, Soya, is immune from *Puccinia coronata* and highly resistant to *P. graminis* var. *avenae.*

4132 **New rusts threaten 1958 oat crop.**
What's New Crops Soils 1958, **10** : No. 6 : p. 29.

The occurrence in 1957 of five crown rust races previously unknown or rare in the USA is noted and it is pointed out that no commercial variety is resistant to all of these races.

4133 ROSEN, H. R.
New races of rust threaten state's oats.
Arkans. Fm. Res. 1958 : **7** : No. 2 : p. 8.

Selections homozygous for resistance to races 213 and 216 of crown rust, which were prevalent in Arkansas during 1957, have been developed from crosses involving Landhafer. In addition, they are uniformly resistant to a number of other diseases and superior in straw strength to Red Rustproof types. Their winter hardiness is such as to adapt them to the northern half of the state. One of the crosses had the following parentage: (Lee-Victoria x Fulwin) x Bonda (Anthony-Bond) x Landhafer.

4134 BYRD, W. P., EARHART, R. W. & ESKEW, E. B.
Oat chlorosis in South Carolina in 1957.
Plant Dis. Reptr. 1958 : **42** : 517–20.

Marked differences were found in varietal reaction to an oat chlorosis which first appeared to be widespread at Piedmont, SC, during 1957. Varieties least affected at Clemson included Arlington, Southland, Le Conte, Lemont and a number of CI oats. There is some evidence for associating this disease with *Helminthosporium* spp.

RYE

4135 REES, H. & THOMPSON, J. B.
Genotypic control of chromosome behaviour in rye. V. The distribution pattern of chiasmata between pollen mother cells.
Heredity 1958 : **12** : 101–11.

Continuing a study already summarized [XXVII, 1678], the authors have confirmed their previous conclusions that the average plant chiasma frequency is genotypically controlled and that the genotype influences the amount of nonheritable variation in chiasma frequency between pollen mother cells within a plant. It has further been shown that both characters respond to seasonal changes and that this response may differ in different genotypes.

Plants with high chiasma frequencies generally but not invariably show a small variation between pollen mother cells, and *vice versa*, and it is suggested that this negative correlation may result from some degree of pleiotropy or from linkage between the genes controlling the two characters. Evidence is presented that this correlation may be altered by environmental and genetical changes and it is concluded that "even within a species the pattern of recombination, particularly in respect of the relation between the average per individual and the variation between cells within individuals, may be adjusted genotypically. It is important to know whether, and under what circumstances, the patterns of recombination both between and within individuals vary between natural populations".

4136 Lawrence, C. W.
Genotypic control of chromosome behaviour in rye. IV. Selection for disjunction frequency.
Heredity 1958 : **12** : 127–31.

"During an inbreeding programme the disjunction frequency of interchange heterozygotes increased by about 10 per cent. from F_3 to F_6. This increase resulted indirectly from selection within families for high self-fertility.

"A marked difference between lines in the material supports the earlier findings of Thompson. [XXVII, 1680]. No difference between interchanges was observed, suggesting that they are controlled by the same genic system and respond similarly to it".

[From author's summary].

4137 Kugler, W. F., Rath, J. & Kruse, G.
Descripción de variedades de centeno cultivadas en Argentina. (**Description of rye varieties grown in Argentina**).
Publ. téc. Estac. exp. Pergamino 1957 : No. 34 : Pp. 28.

Detailed descriptions of the morphological and agronomic characters of seven varieties are presented together with information on their origin. A key to the varieties is included.

4138 Kuckuck, H. & Kranz, A. R.
A genetic analysis of rye populations from Iran.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : 20–21.

Significant differences between 206 populations were found in respect of 11 morphological and agronomic characters. Self fertility varied from 1·51 to 56·4%, with a correlation between the degree of self fertility and the number of lethal or sublethal types segregating in the following inbred generation. It is concluded that the results obtained confirm (1) the polyphyletic origin of cultivated rye and (2) that natural populations are genetically efficient entities in the process of evolution.

4139 Koo, F. K. S.
Deleterious effects from interpollination of diploid and autotetraploid winter rye varieties.
Agron. J. 1958 : **50** : 171–72.

When the diploid varieties Emerald and Imperial were exposed to pollen from Tetra Petkus by bagging the heads of plants in adjacent rows, their seed set was only one-third of that obtained with baggings within each of the diploid ryes. The seed set of Tetra Petkus, when bagged with Emerald or Imperial, was reduced to about one-half to two-thirds of that produced when the $4x$ variety was bagged separately. The greater reduction in the fertility of the diploids may have been due to the fact that only heads of their late tillers could be used; the pollen mixture may thus have contained more grains of Tetra Petkus than of the diploids, a high proportion of abortive $3x$ embryos consequently being formed. A significant increase in percentage of shrivelled kernels only occurred when Tetra Petkus was interpollinated with the diploids. The germinability of seeds graded as plump, partially shrivelled and shrivelled was not significantly affected by interpollination of $2x$ and $4x$ rye.

4140 Mothes, K. & Silber, A.
Über die Variabilität des Mutterkorns. (**On the variability of ergot**).
Forsch. Fortschr. dtsch. Wiss. 1954 : **28** : 101–04.

The pure culture Gatersleben IV varied in yield of sclerotia but not in average alkaloid content under different climatic conditions. Alkaloid content was strongly affected by host variety or species. It was observed that infection of rye plants with a mixture of two distinct races sometimes gave rise to chimeral sclerotia, suggesting that wild ergot in areas where more than one race occurs may similarly include mixed sclerotia.

MAIZE

4141 Genter, C. F.
Plot competition between corn hybrids.
Agron. J. 1958 : **50** : 205–06.

With a view to securing information relevant to procedures of hybrid testing, an analysis was made of the effect of plot competition on the yield of the early hybrid Ohio 54 and late hybrid US578 over a two-year period at the Virginia Tidewater Research Station, USA. The data indicated that some bias due to plot competition in favour of a late hybrid grown adjacent to an early one is likely. Layouts designed to keep together hybrids reaching maturity at similar times may therefore be advisable.

4142 Sarič [Sarić], M. R.
(The effect of X-irradiation upon maize seed differing with regard to degree of hybridization).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **116** : 1026–28. [Russian].

The double-cross [(WF9 x 38–11) x Hy x L317)] showed a higher resistance to X rays, as indicated by a higher percentage of viable seed and better development of the roots and above ground portions of the plants, than either the parental inbred lines or the single-cross hybrids. L317 was the most resistant among the inbred lines but it was less resistant than the single-cross Hy x L317; the inbred gave only 40% viable seed as against 64% in Hy x L317 after a dose of 25,000 r.

4143 Kopecky, O.
Liniové šlechtění kukuřice u nás. (**The line breeding of maize in our country**)
Za vysokou Úrodu 1957 : **5** : 563–65.

A short explanation of the basic principles of line breeding of maize is given. Progress achieved by means of this method in Czechoslovakia is reviewed.

4144 Fenaroli, L.
Problemi tecnici della maiscoltura. **(Technical problems of maize growing).**
Maydica, Bergamo 1958 : **3** : 35–43.

After a review of the work carried out in Italy in the period 1948 to 1957, mention is made of the types of hybrid required and an outline of future work is suggested and discussed.

4145 Pruglo, A. V.
(Forms of international scientific cooperation).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 9 : 142–43. [Russian].

Mention is made of some maize forms which were shown to plant breeders from different countries visiting Dnepropetrovsk and Sinel'nikovo in 1956. The material included a wind-resistant line selected from Sterling, early-ripening bush forms selected from Risovaja 645 [Rice 645] and North Dakota, and tall hybrids between Leaming or Krug and Zolotaja Imperatrica [Golden Empress] from China.

4146 Korrelmais, 1958. **(Maize for grain, 1958).**
Landbouwvoorlichting **15** : Bijl. 29; Ber. Rassenkeuze 1958 : No. 246 : Pp. 2.

Yield tables and brief descriptions are given for 12 varieties tested on different soil types in the Netherlands since 1948.

4147 Pirožnikov, K.
(Maize in the southern Transural).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 2 : 40–44. [Russian].

Sterling and Krasnodor 1/49 were the most productive of forage among varieties and hybrids tested in 1954–56, but in grain yield both varieties were surpassed by the hybrids Bezenčuk 41 x Har'kov 23 and Voronež 76 x Har'kov 23.

4148 Grillot, M.
Le présent et l'avenir des maïs hybrides au Maroc. **(The present and future of maize hybrids in Morocco).**
Bull. Soc. Agric., Rabat 1955 : No. 66 : 3–20.

A brief mention is made of some American hybrids which have done well in Morocco and of the attempts being made to breed types adapted to Moroccan conditions.

4149 **1956 trials of the West African Maize Research Unit, Department of Agriculture, Moor Plantation, Ibadan, Nigeria 1958** : Pp. 35. (Mimeographed)

A report is provided of (1) yield trials of four WAMRU selections and Mexico 7, (2) observations on introductions from Martinique and Costa Rica and West African local varieties and (3) yield trials of hybrids from crosses made in 1954 and 1955.

4150 Brink, R. A. & Mikula, B.
Plant color effects of certain anomalous forms of the R^{r} allele in maize.
Z. indukt. Abstamm.- u. VererbLehre 1958 : **89** : 94–102.

It has been shown that the action of the R^{r} gene for aleurone pigment is modified in heterozygotes with R^{st}, which is the allele responsible for stippled aleurone [cf. XXVII, 1739]. Similar changed forms of R^{r} were found in heterozygotes with R^{lst} and R^{mb}, responsible for light stippled and marbled aleurone respectively. The altered forms of R^{r} have been designated $R^{\mathrm{r:st}}$, $R^{\mathrm{r:lst}}$ and $R^{\mathrm{r:mb}}$. By comparing individuals with the genotypes $R^{\mathrm{r:st}r\mathrm{g}}$, $R^{\mathrm{r:lst}r\mathrm{g}}$, and $R^{\mathrm{r:mb}r\mathrm{g}}$ with $R^{\mathrm{r}r\mathrm{g}}$ plants, it was noted that the modified forms of R^r reduce the colour of the coleoptiles and leaf sheaths; the anthers and glumes of $R^{r:st}rg$ and $R^{r:lst}rg$ individuals were also lightly pigmented.

4151 Brink, R. A.
Basis of a genetic change which invariably occurs in certain maize heterozygotes.
Science 1958 : **127** : 1182–83.

Test crosses were carried out to determine whether plants with stippled aleurone ($R^{st}r$) carry a pollen-transmissible cytoplasmic component (E) which is capable of shifting the R^rrr phenotype from the standard darkly-mottled kernel to the weakly pigmented type of kernel [cf. XXVII, 1739 and 4004]. Standard R^rR^r individuals were pollinated by $R^{st}r$ plants. The R^rR^{st} and R^rr offspring were identified by the kernel phenotypes resulting from selfing. Each of the R^rR^{st} and R^rr plants was crossed as ♂ with the standard *rr* genotype. A control set of crosses was made by using, as ♂ parents in combinations with *rr* individuals, R^rr plants derived from standard *rr* ♀ x standard *RR* ♂. The R^rrr kernels resulting from the three types of crosses may be designated as follows: (1) A = R^rrr (E) from *rr* ♀ x R^rR^{st} (E) ♂, (2) B = R^rrr (E) from *rr* ♀ x R^rr (E) ♂, and (3) C = R^rrr from *rr* ♀ x R^rr (control) ♂. According to the hypothesis of a cytoplasmic effect, C kernels would show the dark mottling characteristic of standard R^r in single dose, and both A and B kernels would be weakly pigmented. This expectation is based on the supposition that, if plants with stippled aleurone carry a pollen-transmitted cytoplasmic component capable of changing the R^r phenotype, this component would be present in the *r* as well as the R^{st} pollen grains. A and B kernels were however dissimilar in phenotype. The B kernels did not differ significantly in aleurone pigmentation from the controls, whereas the A kernels were much more weakly coloured than those in the C group. The data therefore provided no evidence of a cytoplasmic component but revealed that R^{st} or a neighbouring factor induces the transallelic effect and that it is the R^r allele or a closely associated component which is altered in the heterozygote R^rR^{st}.

4152 Brink, R. A. & Wood, D. R.
The neutral effect of modulator in maize on plant and pollen-tube growth.
Amer. J. Bot. 1958 : **45** : 38–44.

Neither as a component of the allele P^{vv} for variegated pericarp, nor when transposed, did modulator (*Mp*) have any effect on pollen-tube growth and the dry weight of the ears.

4153 Chao, C. Y.
Heterotic effects of a chromosomal segment in maize.
Diss. Abstr. 1957 : **17** : Publ. No. 23,309 : p. 2130. (Abst.).

By means of the analytical method of Dobzhansky and Rhoades, a paracentric-inversion strain (In 3a) was used for determining whether genes affecting agronomic characters are present in the long arm of chromosome 3. The allele a_1 for colourless aleurone, situated within the inverted segment, served as marker. Each of the 15 inbreds which were crossed with strain In 3a carried A_1 for coloured aleurone. Since the strain In 3a carried y_1 for colourless endosperm on chromosome 6 and all the inbreds had Y_1 for coloured endosperm, it was possible to test for linkage between locus Y_1 and genes for quantitative characters on chromosome 6. The following conclusions were reached. (1) Genes increasing ear height are present in chromosome 6 of strain In 3a and in the long arm of chromosome 3 in most of the inbreds. These genes do not show overdominance. (2) Genes for earliness of ripening are situated in the long arm of chromosome 3 in inbred WF9 and in chromosome 6 of a number of the other inbreds. (3) Some inbreds carry genes in the long arm of chromosome 3 which result in increased yield. The expression of these genes varies however with the genetic background and environment. (4) The segment In 3a contains genes for high number of kernel rows, while the majority of the inbreds have genes for this character on chromosome 6. (5) Yield and ear number were highly correlated, genes for high number of ears being situated on chromosome 6 of strain In 3a and chromosome 3 in some inbreds. (6) The method of Dobzhansky and Rhoades may be used successfully to locate genes for ear height, row number and ear number. It is less effective when applied to data on yield and time of maturity, in which interactions with the residual genotype and the environment play an important role.

4154 Kramer, H. H., Pfahler, P. L. & Whistler, R. L.
Gene interactions in maize affecting endosperm properties.
Agron. J. 1958 : **50** : 207–10.

The genes *ae*, *du*, su_1, su_2 and *wx* were introduced into lines singly, the ten possible double-recessive combinations and 8 out of the 10 possible triple-recessive combinations being subsequently developed. The gene *wx* was completely epistatic to *du*, su_1, su_2 and their combinations, but not to *ae* or *ae* su_1, in preventing accumulation of amylose. A marked inverse relationship was found between amylose percentages associated with *du*, su_1, su_2 and their combinations in a normal dent background and amylose values conditioned by these same genes in the genotype *ae ae*. The possibility that *ae* conditions a pathway of amylose synthesis different from that governed by *du*, su_1 and su_2 is considered. Birefringence end-point temperatures of starch grains varied from 56 to 92° C. for the different genotypes. The temperatures were not related to amylose content but depended on the individual effects of the genes and their interactions. The pattern of epistasis found with respect to the temperatures included two cases which were cyclic for combinations of three genes. One case was $du > ae > su_2 > du$, in which $du\ ae = du$, $du\ su_2 = su_2$, $ae\ su_2 = ae$ and $du\ ae\ su_2$ was approximately equal to the average of the three double combinations. A similar situation, although less pronounced, was found for *du*, *ae* and su_1. The end-point temperatures provide a clear-cut means of distinguishing genotypes in many cases.

4155 Kramer, H. H., Bear, R. P. & Zuber, M. S.

Designation of high amylose gene loci in maize.

Agron. J. 1958 : **50** : p. 229.

Tests for allelism have revealed that *ae* is identical with *ha*, *du* with ha_2 and su_2 with su_x. It is suggested the *ae*, *du* and su_2 should be adopted as the permanent designations since these were the first to appear in the literature. These three genes, together with su_1 and *wx* constitute the genes so far known to be concerned with the ratio of amylose: amylopectin in the endosperm.

4156 Parsons, P. A.

A survey of genetical interference in maize.

Genetica 1958 : **29** : 222–37.

Published data on cases of linkage between three or more factors are examined in an attempt to determine the nature and degree of interference. As a measure of interference the Kosambi coefficient proposed by Owen is used [XXIV, 18]. The analysis, although insufficiently accurate in several respects, supports the main points of Owen's theory of genetical recombination [XIX, 2289 and XXI, p. 450]. It is concluded that there is no interference across the centromere of maize chromosomes and that the intercept lengths are distributed independently when measured on an interference metric.

4157 Miravalle, R. J.

Detection of linkage effects on estimates of genetically interpretable variances and on estimates of the average degree of dominance of genes affecting quantitively inherited characters in a hybrid population of corn.

Diss. Abstr. 1957 : **17** : Publ. No. 24,233 : 2389–90. (Abst.)

The effect of linkage on estimates of σ^2_g, σ^2_d and $\bar{a}$ for yield, ear number, ear diameter, ear length, ear height, plant height and tasselling date was studied in the F_2 back-cross progeny and back-cross progenies of third-cycle selection material of the cross NC34 x NC45. No consistent effect of linkage on σ^2_g was observed. The estimate of σ^2_d was larger in the F_2 than in the third-cycle material. This effect may have been due to linkage but since $\bar{a}$ failed to decline in some cases in passing from the F_2 to the third cycle, the possible influence of overdominant genes must also be considered.

4158 Di Martino

La coltivazione del granoturco nel bresciano. (**Maize growing in the province of Brescia**).

Agric. bresciano : 1958 : **6** : p. 3.

The entire maize crop in this north Italian province now consists of hybrids in the plains and over 50% also in the hill zones. Yields of up to 123 c. per ha. were obtained in 1957 and certain hybrids not yet released did better still. Thus the hybrid Parentale Cervino produced 197·57 c. per ha. under irrigation in the plains. In the hill zones with irrigation, hybrids of the type U32 are still the best, except for late sowing or as second crop, when S1, S2, Embro 21 or Asgrow 88 are recommended.

4159 Li, C.-H., Cheng, C.-K., Chen, C.-Y. & Pei, S.-L.

(**Studies on breeding hybrid maize. I. The results of breeding intervarietal hybrids and hybrids between inbred lines**).

Pei-ching Nung-yeh Ta-hsueh Hsueh-pao/Sci. Rep. Peking agric. Univ. 1957 : **3** : 1–22. [Chinese].

Yield trials in northern China during 1950–6 of variety hybrids, top crosses, and single and double crosses involving inbred lines are reported.

The breeding material comprised both local and American types. Hybrid vigour was greatest in the hybrids between inbred lines.

4160 ROTHGEB, R. G.
The performance of hybrid corn 1955–1957.
Misc. Publ. Md. agric. Exp. Sta. 1958 : No. 319 : Pp. 27.

The results carried out on hybrids with open and closed pedigrees at three centres in Maryland are summarized.

4161 FELECAN, V.
Comportarea la hibridare a unor soiuri de porumb. (**Behaviour on hybridization of some maize varieties**).
Stud. Cercet. Agron., Cluj 1957 : **8** : 129–37.

Details are given on the yield and vegetative period of single and double intervarietal crosses and crosses involving inbred lines under trial in Rumania. The characters in respect of which the various varieties are useful parents are indicated.

4162 FIELDING, W. L.
Trends of agricultural thought and research in the Federation of Rhodesia and Nyasaland in the last twenty-five years.
Emp. J. exp. Agric. 1958 : **26** : 183–94.

Progress made since 1933 has included the breeding of hybrid maize suitable for these areas and for both European and African farming methods.

Report of Twelfth Hybrid Corn Industry Research Conference held in Chicago, Illinois, December 4 and December 5, 1957 : Publ. Amer. Seed Tr. Assoc. 1957 : No. 12 : Pp. 99.

4163 *Jenkins, M. T. Evaluation of lines for resistance to* Helminthosporium. *(pp. 7–13).*

Tests carried out over a six-year period indicated that some inbreds of maize were resistant to *Helminthosporium turcicum*, whatever the seasonal conditions. The lines with the best records were L97, H856 and CI15. Studies of crosses of resistant lines with susceptible testers revealed that the former differed in value as parents transmitting resistance. It was concluded that inbreds CI90A (M14 x L97), GE440, CI93A (CI15 x L97) and Wh4971 are likely to be the best parents in this respect [XXVIII, 1323]. Analyses by means of translocations have shown that genes for resistance are present on 9 of the 19 chromosome arms tested and that a major gene for this character is situated on the short arm of chromosome 7 [XXVII, 4013].

4164 *Zuber, M. S. High amylose corn. (pp. 14–18).*

An account is given of investigations which have been reported in detail elsewhere [2942].

4165 *Johnson, I. J. The role of the experiment stations in basic research relating to corn breeding. (pp. 31–36).*

The problem of the role public and private organizations should play in fundamental research is discussed from the standpoint of the experiment stations.

4166 *Josephson, L. M. Breeding for early prolific hybrids. (pp. 71–79).*

Breeding in Tennessee for earliness and prolificacy or the ability to produce more than one ear per plant is surveyed. Prolific hybrids may be better able to make adjustments to soil-fertility and moisture conditions, higher yielding capacity and greater drought resistance being shown in thinner stands of such hybrids than of single-ear types. Inbreds have been developed which combine earliness, derived from the Corn-Belt single crosses used as one set of parents, and the prolificacy, earworm resistance and quality of lines of the adapted variety Jellicorse. Double hybrids between early, prolific single crosses of such inbreds and single crosses of inbreds resistant to blight (*Helminthosporium turcicum*) have equalled hybrids involving four blight-resistant lines in yield and lodging resistance, and had a higher number of ears per plant and lower moisture percentage of the grain at harvest. The lower yield of hybrids derived entirely from early prolific inbreds was due to smaller size of the ears and failure to produce additional ears under conditions of midseason drought. Selection of further inbreds is under way, using crosses between (1) Jellicorse lines and a wide range of Corn-Belt inbreds, (2) blight-resistant early lines and (3) blight-resistant lines and foreign varieties. Blight-resistant inbreds are also being crossed with early prolific inbreds to improve resistance in the latter. Comparative tests of prolific and single-ear hybrids have suggested that increased number of ears in early prolific hybrids does not entirely compensate for wider spacing. In addition, the reduced ear size of this type does not appeal to farmers, although this drawback will lose its importance with increased use of mechanical harvesters. It is however concluded that, even if prolificacy may be relatively unimportant, the earworm resistance, greater husk length and improved quality attained in the prolific early hybrids has justified the breeding programme.

4167 *Leng, E. R. Genetic production of short stalked hybrids.* (*pp. 80–86*).

According to preliminary results obtained in Illinois, dwarf hybrids of the brachytic-2 type possess considerable promise in lodging resistance. On the average they have not however equalled their normal counterparts in yield [cf. XXVII, 1320]. In connexion with their questionable yielding capacity, it is pointed out that so far little opportunity for selection of the recovered dwarf lines for combining ability has existed, and that back crossing to the standard lines has not yet been effected for a sufficient number of generations to ensure complete recovery of the original genotype. In addition, it is stressed that the dwarf material is not likely to reach its greatest value until strains with wide genetic diversity are available.

4168 LENG, E. R.
Performance of commercial corn hybrids in Illinois, 1957.
Bull. Ill. agric. Exp. Sta. 1958 : No. 622 : Pp. 40.

The results of tests on 412 commercial hybrids are given.

4169 JUGENHEIMER, R. W., WILLIAMS, K. E. & CROWLEY, A. J. (JUN.).
Performance of experimental corn hybrids in Illinois, 1957.
Bull. Ill. agric. Exp. Sta. 1958 : No. 623 : Pp. 44.

The results of trials of inbreds and single, three-way, top and double crosses with respect to yield and several other characters at five centres are reported. The combinations tested included high-oil double crosses and borer-resistant single and double hybrids.

4170 SANTOS, I. S.
An evaluation of Cuban corn as a source of genetic diversity for Philippine hybrids.
Philipp. Agric. 1957 : **41** : 378–91.

Details are given and discussed of the results of yield trials of single crosses among College Yellow and Cuban Yellow inbred lines and between College Yellow and Cuban Yellow lines in the Philippines in 1953. Crosses between lines from the two sources gave better performances, even under poor conditions, than crosses among lines from each source and the improvement was maintained in double cross hybrids involving both sets of inbreds also.

4171 RAJKI, S.
Van-e köze a formalista genetikai elméletnek a heterózisnemesítéshez? (**Has formal genetical theory anything to do with heterosis breeding?**).
Növénytermelés 1957 : **6** : 367–72.

From a survey of the literature it is concluded that the discovery of the method of heterosis breeding in maize was fortuitous and not based on previous genetical theory. The Mičurinist vitality theory is regarded as providing a more satisfactory explanation of heterosis than formal genetics.

4172 PETROV, D. F.
(**The importance of apomixis in maintaining heterosis**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **112** : 954–56. [Russian].

Selection of maize forms for heritable apomixis as a means for maintaining heterosis is discussed. The method is thought to possess advantages over the use of polyploidy or structural hybrids recommended by other writers [XXVI, 2293].

4173 KEDHARNATH, S.
The integrity of transposed modulator in maize.
Diss. Abstr. 1957 : **17** : Publ. No. 24,302 : p. 2389. (Abst.)

A series of eight independent transpositions of modulator derived from a common P^{vv} allele were incorporated with inbreds 4Co63 and W23. The transposed modulators were then compared with respect to their effect on the frequency of (1) somatic mutation of P^{vv} to P^{rr} and (2) early chromosome breaks at locus *Ds*. The transpositions differed significantly in their influence on the frequencies of (1) and (2) in the 4Co63 background. They fell into two apparently homogeneous groups for their effect on the frequency of (1) or (2), the existence of two different states of modulator thus being indicated. The transpositions did not however differ in their effects in the W23 background. The frequencies of (1) and (2) for each of the transpositions in 4Co63 were not correlated. Evidence was however obtained that for a particular state of modulator, as determined by its effect on the frequency of (1) more than one state could exist with respect to the effect on the frequency of (2). Since transposed modulator behaves as a unit in inheritance, it is possibly functionally bipartite, the subunits being capable of mutating to different extents.

4174 OSLER, R. D., WELLHAUSEN, E. J. & PALACIOS, G.
Efecto de la selección visual durante la autofecundación del maíz, sobre su aptitud combinatoria. (**The effect of visual selection during selfing of maize upon its combining ability**).
Foll. téc Secretaría Agric. Ganad., Méx. 1957 : No. 22 : Pp. 16.

Single crosses between S_1 lines were compared with the corresponding crosses between advanced selfed lines selected from the S_1 lines on the basis of visual characters. Both local and introduced material was used. The data obtained showed that visual selection resulted in significant improvements in yield, external ear characters and appearance of the plant in 57%, 60% and 41% of the hybrid combinations, respectively. A higher proportion of the crosses between introduced lines showed improvements in yield and ear appearance than of those between local lines, while the reverse was true for plant appearance.

4175 H–127, nuevo maíz forrajero para regiones entre 2,000 y 2,300 metros de altura. (**H–127, a new forage maize for regions between 2000 and 2300 m. in altitude**).
Agricultura téc., Santiago 1957–1958 : No. 5 : 25, 47–48.

This hybrid, developed at El Horno Experimental Station, Chapingo, Mexico, is superior in yield of grain and green fodder to local varieties. Its chief characteristic is that the plant is still green and suitable for ensilage by the time the ears are ripe. In addition, it resists lodging under damp or windy conditions, red spider mite, *Puccinia* and *Helminthosporium* and tolerates drought. The stems are slender and can be eaten in their entirety by stock.

4176 SOMORJAI, F.
A szegedi sárga lófogú kukorica. (**The Szeged yellow dent maize**).
Agrártudomány 1958 : **10** : No. 2–3 : 34–36.

The Hungarian variety Szegedi sárga lófogú [Szeged Yellow dent], derived from a Funk population of American origin, was released in 1951. It is widely adapted, ripens late, requires a high temperature, has thick, strong stems which do not lodge readily, generally bears one ear per plant and is moderately resistant to diseases. It produces 20–25 centners per hold*, sometimes 28–30.

4177 OBREGON, F. & OSLER, R. D.
H–504, nuevo maíz para zonas tropicales. (**H-504, a new maize for tropical zones**).
Agricultura téc., Santiago 1957–1958 : No. 5 : p. 23.

The above hybrid, produced at San Rafael, Ver., Mexico, equals H–503 in agronomic characters in the regions where it has been tested and surpasses it by about 7% in yield. It is resistant to *Helminthosporium.*

4178 PALACIOS, G. & OSLER, R. D.
Nuevos maíces para regiones altas. (**New maizes for high regions**).
Agricultura téc., Santiago 1957–1958 : No. 5 : p. 24.

The two hybrids H–126 and H–125 and the variety V–10 (V–105), recommended for regions at 1900–2100 m., 2000–2300 m. and above 2400 m. in altitude, respectively, all yield considerably more than other varieties in these regions. The first two are vigorous, resistant to lodging and diseases and respond well to fertilizers. The second tolerates short periods of drought. The last produces a very high proportion of plants with two ears, is fairly vigorous and resists rust.

4179 HATHEWAY, W. H.
Races of maize in Cuba.
Publ. nat. Acad. Sci. nat. Res. Coun., Wash. 1957 : No. 453 : Pp. 75.

In view of the widespread occurrence of intervarietal hybridization in Cuba, the concept of race was modified as follows. In order to eliminate chance segregates and recent mixtures from consideration, a race of maize is defined as a group of one or more populations of true-breeding individuals with a number of significant characteristics in common. In addition, recognition of the race as an agricultural variety by the farmers who grow it should be taken into consideration. The general procedure followed has therefore been to examine extensive collections for extreme forms which by hybridization could have given rise to the intermediate types now prevalent. Populations of the putative ancestral races were then tested in experimental plantings to see whether they bred true to type. Extreme forms not breeding true were regarded as chance segregates. Descriptions are given of the seven races of Cuban maize recognized by morphological, cytological and physiological characters and by information supplied by farmers. Three commercial races, the semiflint Criollo and dent types Tusón and Canilla, were probably brought to Cuba by the West Indian Arawak between 1200 and 1440 A.D., while a fourth commercial race, Maíz Argentino, an orange-yellow flint, is a recent introduction from Argentina. Two races of popcorn, White Pop and Yellow Pop, are grown on a limited scale for domestic consumption only. The former is a pearl type of poor popping quality and is believed to have arisen through hybridization between a white rice popcorn imported from the USA and the Cuban race Criollo. Yellow Pop, a rice type characterized by earliness, short stature and heavy pubescence, is apparently a recent selection from the American variety Queen Golden. The seventh race, White Dent, collected at a single farm in Oriente province, seems to be identical with the Mexican maize Zapolote Chico and may be a recent introduction. Information supplied by farmers concerning cultural practices indicated that hybridization and selection are playing a predominant role in the contemporary evolution of Cuban maize. Ear and grain types resembling those of the pure races are favoured by the farmers in selection, but since no selection is made for vegetative or tassel characteristics except indirectly in so far as these may be associated with ear and grain types, repeated natural hybridization tends to result in plants which are intermediate between the pure races in the two first-mentioned features. Thus the vegetative and tassel characters of the commercial races tend to converge more and more towards one another.

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* 1 hold = 1·42 acres = 0·57 ha.

4180 Mesa Bernal, D.
Historia natural de maíz. (**Natural history of maize**).
Rev. Acad. Colomb. Cienc. exact. fís. nat. 1957 : **10** : No. 39 : Pp. 106.

The history of maize cultivation is outlined and theories regarding its progenitors and its possible origins in the Old World, Central America or one of the South American states are surveyed and discussed, particular attention being given to the views of Mangelsdorf and his colleagues [X, 760]. Transcriptions of descriptions of maize by chroniclers of the sixteenth century are included.

4181 Voronova, A.
(**Hardening the seed of maize**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **4** : 37–39. [Russian].

The winter hardiness, earliness, uniformity of maturation and length and weight of ears of such varieties as Pervomajsk were improved by subjecting the grain to alternating temperatures at the Dalmatovo State Varietal Field. The changes are said to be heritable.

4182 Rajháthy, T.
Polyploid series in maize.
Bot. Notiser 1957 : **110** : 126–28.

At the Martonvásár Agricultural Research Institute, Hungary, plants with somatic chromosome numbers of 10, 11, 30 and 40 have been produced in addition to the normal diploid ($2n = 20$). The triploids were highly sterile and produced mainly diploid offspring on selfing but also some trisomics and tetrasomics.

4183 Deanon, J. R. (Jun.).
Treatment of sweet corn silks with maleic hydrazide and colchicine as means of increasing the frequency of monoploids.
Philipp. Agric. 1957 : **41** : 364–77.

The frequency of haploid embryos was significantly increased by treatment with a solution of 50 p.p.m. of maleic hydrazide. Higher concentrations of maleic hydrazide were less effective and colchicine treatment had no effect.

4184 Petrů, E. & Řetovský, R.
Převod jednodomé povahy kukuřičné rostliny v čistě samičí v její ontogenesi. (**Reducing the monecious character of the maize plant to the purely female condition during ontogeny**).
Čsl. Biol. 1957 : **6** : 393–95.

When apical parts of coleoptiles of Stupická raná [Stupice Early] were cultured in a nutrient medium at 24° C., they regenerated new plants whose inflorescences were purely female.

4185 (**Early maize**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **4** : p. 39 [Russian].

Mention is made of a waxy maize variety Kijuška from Burjat-Mongolia. It is said to possess breeding value on account of its great earliness.

4186 House, L. R. & Nelson, O. E. (Jun.).
Tracer study of pollen-tube growth in cross-sterile maize.
J. Hered. 1958 : **49** : 18–21.

The technique used to study pollen tube growth involved injecting a dilute solution of HCl containing phosphate ions with P^{32} into the stem of the pollen parent just below the ear-bearing node; two days later the pollen was sufficiently radioactive for use. Preparations were made of ovules and silks at varying periods after pollination. X ray photographs were taken of the preparations. Various crosses were made in order to study development of pollen tubes carrying the alleles Ga^s or *ga* on styles homozygous for Ga^s. More compatible than incompatible pollen tubes were found to grow in the styles and during the two to eight-hour growth period, the growth of compatible pollen tubes had a linear relationship with time. The growth rate of the incompatible tubes seldom equalled that of compatible pollen tubes and it slowed down until development ceased after eight hours. An incompatible pollination had no apparent effect on either compatible or incompatible pollen tubes growing through the same style on the following day.

4187 DUVICK, D. N.

Yields and other agronomic characteristics of cytoplasmically pollen sterile corn hybrids, compared to their normal counterparts.

Agron. J. 1958 : **50** : 121–25.

Seven normal hybrids of maize were compared with their cytoplasmically pollen-sterile counterparts at six planting rates in three localities in the USA during 1955. The sterile hybrids comprised four double and two single crosses carrying the Texas (T) type of cytoplasm and one double cross with S cytoplasm. Substitution of T cytoplasm for the normal type altered the performance of the hybrids with respect to grain yield, percentage of barren stalks, tillering and, in the case of one hybrid, root lodging. Substitution of S cytoplasm affected grain yield and percentage of barren stalks. The extent and direction of the changes were markedly influenced by genotype and environment. No consistent differences were noted between normal and sterile counterparts as regards stalk breakage, moisture percentage of the grain and infection by leaf blight due to *Helminthosporium maydis* (*Cochliobolus heterostrophus*) and *H. turcicum.*

4188 STRINGFIELD, G. H.

Fertility restoration and yields in maize.

Agron. J. 1958 : **50** : 215–18.

Pollen-restored plants carrying the Texas (T) type of cytoplasm have on the whole been superior in grain yield to their male-sterile siblings and half siblings at the Ohio Agricultural Experiment Station. This result does not agree with the general finding of other workers that male-sterile hybrids are as fully productive as their normal counterparts. Normal and restored fertile hybrids may therefore be different for the following possible three reasons: (1) the dominant *Rf* gene or genes restoring pollen fertility in T cytoplasm may have favourable pleiotropic effects on vigour and yield, (2) the T type of cytoplasm may be more efficient in relation to grain yield than the cytoplasms associated with ♂ potency in the genotypes of American inbreds lacking the *Rf* gene or genes, or (3) a heterotic cytoplasm x genotype interaction dependent upon *Rf* genes may occur. Additional information is required on the general and specific relationships of normal fertile, male sterile and restored fertile hybrids with regard to yield.

4189 BRESSANI, R. & MERTZ, E. T.

Studies on corn proteins. IV. Protein and amino acid content of different corn varieties.

Cereal Chem. 1958 : **35** : 227–35.

No major differences in aminoacid composition were found between several American and Guatemalan varieties. The percentage total nitrogen of the grain contributed by the pericarp plus tip cap varied from 1·8 in the single cross US High Protein (HP) to 3·3 in the commercial Midwest hybrid US4251. The contribution of the endosperm to the total nitrogen varied from 68·4% in the single cross US High Oil (HO) to 83·2% in the single cross US High Protein (H5), while that of the germ varied from 14·6% in US High protein (H5) to 29·2% in US High Oil (HO). The Guatemalan selection had intermediate values. The proteins of the germ and endosperm were extracted with an alkaline copper reagent and the extracts separated into (1) acid-soluble, (2) alkali-soluble and alcohol-soluble and (3) alkali-soluble and alcohol-insoluble fractions. Varietal ranges of 17 to 26%, 41 to 60% and 17 to 31% of the total nitrogen were respectively obtained for (1), (2), and (3) of the endosperm. The corresponding variations for the germ were 30–40%, 5–10% and 49–54%. The copper extraction-fractionation method should prove useful in breeding for protein quality.

4190 HOFMEYR, J. D. F.

Pollentube growth studies of inbred lines of *Zea mays*, L.

S. Afr. J. Sci. 1958 : **54** : 59–60. (Abst.).

Equal quantities of pollen from yellow and white-grained inbreds were used to pollinate white inbreds and the white variety Potchefstroom Pearl. Data on the ratios of yellow: white seed in the ears thus pollinated suggest that a relationship exists between pollen-tube growth and known combining ability. The results of yield tests of the crosses must be examined before drawing any final conclusion.

4191 SCHWARTZ, D.
On the stabilization of a ring chromosome in maize.
Genetics 1958 : **43** : 86–91.

A chromosome-9 ring with markers *C* and *Wx* was produced by X irradiation of pollen carrying a normal chromosome complement. This ring showed typically unstable behaviour, giving rise to dicentric rings at anaphase and in the appropriate genotype to kernels variegated for both *C–c* and *Wx–wx*. Two smaller rings were isolated from it, one carrying *C* but not *Wx* and the other *Wx* but not *C*. Each of these rings was unstable. Plants raised from variegated kernels containing the *C* rings and *c* on the two normal homologous chromosomes were crossed with *c* pollen. With one exception, all the ears thus obtained consisted of the expected colourless and *C–c* variegated kernels. The exceptional ear contained the expected low proportions of coloured kernels (16%) with a trisomic fragment. These kernels were however uniformly coloured. The absence of variegation was indicative of a change in the ring chromosome, resulting in a stable fragment. This stability was maintained through four generations of back crossing. Stabilization of a ring chromosome could be the consequence of one of two events: (1) opening out of the ring to form a rod chromosome fragment in which sister-strand exchanges do not give rise to dicentrics; or (2) maintenance of the ring structure with a modification in its behaviour so that dicentrics are not produced, as in *Drosophila*. The cytological evidence favoured (2). Reciprocal crosses were made between plants carrying the stable *C* ring and homozygous for *c* and *wx* on the normal homologous chromosomes and plants similarly marked but carrying instead the unstable *Wx* ring. If ring stability were under genotypic or cytoplasmic control, both rings would be expected to show identical behaviour when present in the same cells. The starchy, coloured kernels indicative of the presence of both rings were however non-variegated for *C* and variegated for *Wx*. Ring stability therefore depends on the structure of the ring chromosome itself. Apparent post-meiotic reversions of the stable *C* ring to the unstable condition were recovered.

4192 VALENTINE, F. A.
Orange variegated, a mutant originating from variegated pericarp in maize.
Diss. Abstr. 1957 : **17** : Publ. No. 24,334 : p. 2390. (Abst.).

The allele P^{ovov} for orange medium variegated pericarp differs from P^{vv} ($= P^{rr}Mp$) for the medium variegated phenotype by causing a homogeneous orange-red background between the red stripes and a reduction in the number of stripes. Eight cases of the mutation have been discovered in P^{vv} strains of diverse geographical origin. The mutational behaviour of P^{ovov} parallels that of P^{vv}, the most frequent mutations being those producing the phenotypes self red and orange light variegated. The ability to promote the dissociation type of chromosome breakage is another characteristic common to P^{ovov} and P^{vv}. The breakage incited by $P^{ovov}P^{ovov}$ appeared however to differ from that caused by the original P^{vv} alleles in both time of occurrence and frequency. It is postulated that mutation of P^{vv} to P^{ovov} represents a change in the state of modulator, designated Mp^{a}. When situated at locus *P*, Mp^{a} suppresses the action of P^{rr}. When Mp^{a} is transposed, the orange light variegated pericarp is produced.

4193 PÁSZTOR, K.
Vetésidő-kisérlet kukoricával. (**Sowing-time experiments with maize**).
Debrecen. Mezőgazd. Akad. Tudomány. Évk. 1956 : (1957) : 217–37.

Details are given of the performance of five varieties after sowing on six different dates at Debrecen, Hungary. Most of the varieties yielded best when sown at the beginning of May, but some varietal differences in response to sowing date were observed.

4194 VECSEY, T.
Silázás céljára vetett kukoricák összehasonlító értékelése. (**Comparative evaluation of maize varieties grown for silage**).
Debrecen. Mezőgazd. Akad. Tudomány. Évk. 1956 : (1957) : 99–110.

Data are given on the yields of green and dry matter, percentages of ears, leaves and stems and content and yield of starch and digestible protein of 12 varieties and hybrids tested during 1951–53 at Debrecen, Hungary. Crosses involving Mindszentpusztai fehér [Mindszentpuszta White] were the best.

4195 KOEHLER, B.
Pericarp injuries in seed corn: prevalence in dent corn and relation to seedling blights.
Bull. Ill. agric. Exp. Sta. 1957 : No. 617 : Pp. 72.

The results of the investigations included the following. The ranking of inbreds for resistance to *Pythium debaryanum* and *Penicillium oxalicum* varied according to whether the pericarp was sound, crown-injured or injured near the plumule. A study of single crosses involving inbreds resistant and susceptible to *P. debaryanum* revealed a strong maternal effect upon resistance to seedling blight caused by this pathogen. A significant paternal influence was also detected but it could not be predicted from the ratings of the inbreds for resistance.

4196 CERVANTES, J., RODRÍGUEZ, A. & NIEDERHAUSER, J. S.
Resistencia al virus causante del achaparramiento del maíz. (**Resistance to the virus causing stunting of maize**).
Foll. téc. Secretaría Agric. Ganad., Méx. 1958 : No. 29 : Pp. 18.

Wide intervarietal differences in resistance to the above virus disease were found among 25 maize varieties after artificial inoculation. Greatest resistance was generally found in the maizes showing the highest degree of teosinte introgression, such as Zapalote chico, Tuxpeño, Tepecintle and Vandeño, all of which are recommended for further breeding. Variation in resistance occurred also in a teosinte collection, resistance being found only in a strain from Honduras. In both maize and teosinte varieties it appears to be the tripsacoid component which confers resistance.

4197 MIDDENDORF, M.
Untersuchungen über Methoden zur Infektion mit Maisbrand (*Ustilago zeae* (Beckm.) Unger) und ihre Abhängigkeit von Alter, Temperatur und Sorte. [**Investigations on methods for infecting with maize smut (*U. zeae* (Beckm.) Unger) and its dependence on age, temperature and variety**].
Züchter 1958 : **28** : 80–94.

Procedures used for infecting maize with *U. zeae* were compared; Brefeld's method was most satisfactory when a spore suspension was applied three times at one-day intervals to the young leaves. Raising the temperature shortened the incubation time but did not affect the severity of the attack. No differences in susceptibility were found between germinating seedlings and those at the five-leaf stage of the same variety; early selection for resistance to *U. zeae* is therefore possible. Six varieties were tested in the field and in the greenhouse; the percentage of plants attacked was more than 57% for each variety but only one variety was significantly more susceptible than the others.

4198 STABY, J. H.
New strides in corn borer resistance.
What's New Crops Soils 1958 : **10** : No. 7 : p. 16.

Breeding for resistance to corn borer in Minnesota is mentioned; a flint maize variety from Argentina is being used as a source of resistance. It is thought that resistant plants contain a substance which the borers find unpleasant.

4199 **Electronic machine helps hybrid corn.**
What's New Crops Soils 1958 : **10** : No. 7 : p. 28.

At the University of Illinois, an electronic computer is being used to predict which crosses between maize varieties are most likely to produce progeny with the desired characters. Breeding for high oil and protein content, resistance to European corn borer and high yield is in progress; attempts are also being made to produce varieties which stand up well and mature properly.

4200 WALTER, E. V., WENE, G. & HARRIS, E. D. (JUN.).
Corn earworm resistance in commercial sweet corn hybrids.
US Dep. agric. 1958 : ARS–33–46 : Pp. 8.

The earworm injury shown by about 180 maize hybrids in tests in Indiana, Texas, Florida, Mississippi and Illinois is shown in table form, expressed as a percentage of the average for all lines in any one field. Golden Mine showed only 7% injury but it is thought that this may result from its silking several days earlier than the other hybrids in the test, so that moths were not attracted to the field at that time.

4201 VAN EIJNATTEN, C. L. M.
A preliminary investigation on the resistance to West African stem-borers in *Zea mays*.
Mem. W. Afr. Maize Res. Unit, Ibadan 1958 : No. 13 : Pp. 13. (Mimeographed).

In the coastal areas of West Africa, *Sesamia* spp. and *Busseola fusca* are the chief stem borers of maize. Evidence has been obtained indicating that the inbred Minnesota A42.645, which is resistant to the European corn borer (*Pyrausta* *nubilalis*), may contain recessive genes for resistance to West African stem borers. Inbreds should be developed from the back cross Minn. A42.645^2 x WAMRU2 and tested for resistance under controlled environmental conditions. The latter parent, a selection of the variety Coahuila 8 from the Rockefeller Foundation, Mexico, is susceptible to borers but gives reasonably good yields, compared with the susceptible local varieties.

4202 Smith, D. L. & Niederhauser, J. S.
Occurrence of corn stunt virus in central America and Colombia.
Plant Dis. Reptr. 1958 : **42** : p. 512.

Different lines of maize were found to vary considerably in their susceptibility to corn stunt virus; there appeared to be a number of sources of resistance. The Mesa Central virus strain predominated in the above regions during 1956 and 1957.

4203 Prywer L., Cz.
Meiosis en *Tripsacum Maizar* (H. & R.).
(**Meiosis in *T. maizar* (H. & R.).**
Rev. Soc. mex. Hist. nat. 1954 : **15** : 59–71.

Meiosis in pollen mother cells was normal, with $n = 18$, although slight lagging occurred in a few cells. Unlike *T. dactyloides*, the pachytene chromosomes of this species lack knobs. It is thought that this and similar species may have contributed to the development of tripsacoid maizes without knobs.

BARLEY

Proceedings of the Congress of the European Brewery Convention, Copenhagen, 1957 : Pp. 384.

The following contributions are of interest to breeders and geneticists:—

4204 *van Veldhuizen, H. The Barley Committee of the European Brewery Convention.* (*pp. 57–66*).

The results of yield and micromalting tests of barleys grown in different countries during 1955 are discussed, together with the preliminary results of the 1956 yield trials. In both years the obligatory varieties tested were Kenia (standard), Busser, Carlsberg II, Domen and Proctor. Optional varieties in 1955 were Beorna, Ingrid, Maythorpe and Wisa and in 1956 the three last-mentioned varieties and Beka. In both years Carlsberg II and Proctor gave the highest agricultural yield. The good malting qualities of Proctor were confirmed in 1955.

4205 *Meredith, W. O. S., Bettner, R. E. & Anderson, J. A. Laboratory drum-malting equipment.* (*pp. 92–103*).

Equipment devised at the Grain Research Laboratory, Winnipeg, Canada, for malting a 7 kg. sample of barley is described. It consists of three units: steep tank, germination chamber and kiln. All units are fully automatic for continuous operation without the need for attention outside normal working hours. With this equipment, which permits variation of malting conditions, detailed information may be secured on varietal differences in malting properties.

4206 *Oppenoorth, W. F. F. The sporulation of brewing yeasts.* (*pp. 222–40*).

In connexion with the attempt to improve brewery bottom-fermentation yeast by crossing, investigations have been carried out at the National Instituut voor Brouwgerst, Netherlands, to study factors affecting sporulation. When all cultural conditions were kept constant, a given strain had a characteristic spore diagram, based on the percentages of asci with 1, 2, 3 and 4 spores. Only the red part of the spectrum stimulated sporulation, types with short-day, long-day and neutral reactions to red light being distinguished.

4207 Eade, A. J.
Spring barley variety trials, 1951–1956.
J. nat. Inst. agric. Bot. 1957 : **8** : 36–49.

The results of trials of Agio, Beorna, Bonus, Bonus II, Domen, Drost [King], Fero, Haisa II, Heimdal, Kron [Crown] and Busser, with Kenia or Proctor as control, at centres chiefly in England are summarized. Data from small-scale malting tests are included. None of the varieties showed an all-round improvement over Proctor.

4208 Ward, D. J.
World collection of barley. Data compilation No. 5: Disease and agronomic data on 431 Manchurian barleys grown at five locations in the North Central United States and Manitoba, Canada in 1956.
US Dep. Agric., Agric. Res. Serv., Field Crops Res. Branch Beltsville, Md. 1957 : unpaginated. (Mimeographed).

This progress report provides a tabulated record of the above data. It also includes tables indicating strains which gave a good performance with respect to resistance to *Septoria passerinii*, *Erysiphe graminis* or lodging in both 1955 and 1956.

4209 TRAVERS, S. J. & WEBSTER, T.
N.A.A.S./N.I.A.B. spring barley variety trials: 1952–1954.
J. nat. Inst. agric. Bot. 1957 : **8** : 50–61.

Eighty-four trials conducted jointly in England and Wales by the National Institute of Agricultural Botany and National Agricultural Advisory Service are reported. The main varieties tested were Herta, Proctor, Rika, Carlsberg, Freja and Kenia. The first three had the highest yields and stiffest straw.

4210 Forsøg med bygsorter 1953–1956. (**Trials of barley varieties, 1953–1956**).
Tidsskr. Planteavl 1958 : **62** : 173–76.

Data on lodging, straw length and yields of grain and straw of 11 varieties under two different fertilizer treatments on various soil types in Denmark are presented.

4211 WILTEN, W.
De veldproeven in 1957. (**The trial fields in 1957**).
22e Nacobrouw Jb. 1958 : 81–94.

The results of trials of new and standard barleys at various stations in the Netherlands are reported. None of the new varieties was better than Balder.

4212 WILTEN, W.
Opbrengsten, rassenstatistiek en raseigenschappen van zomergerst. (**Yields, statistics and characteristics of varieties of spring barley**).
22e Nacobrouw Jb. 1958 : 106–08.

Information on the yields, distribution, quality and agronomic characters of the chief spring barleys grown in the Netherlands is given.

4213 MOËS, A.
L'amélioration de l'orge d'hiver à la Station de Recherches de l'État, pour l'Amélioration des Plantes de Grande culture à Gembloux. (**The improvement of winter barley at the State Research Station for the Improvement of Crop Plants at Gembloux.**)
Rev. Agric., Brux. 1958 : **11** : 441–42.

In this brief account, reference is made to the Belgian barley variety Manon [cf. XXVII, 1749]. The aims of breeding at Gembloux include improved yield and grain quality, winter hardiness and resistance to lodging and diseases.

4214 VELICAN, V., CEBOTARU, V., POP, E. & POP, O.
Rezultatul culturilor comparative cu soiuri şi linii de orz de primăvară, din anii 1949–1956, la Staţiunea de Cercetări Agronomice-Cluj. (**The results of comparative trials of varieties and lines of spring barley during 1949–56 at the Cluj Agronomic Research Station**).
Stud. Cercet. Agron., Cluj 1957 : **8** : 23–42.

Trials of an extensive series of varieties and breeding lines are reported. Data are given on yield of grain and forage, germination, vegetative period and other characters of agronomic importance.

4215 KIRIYAMA, T. & KONISHI, T.
(**Studies on the effect of selection in barley breeding. The heritability of economic characters**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1956 : **4** : 219–23. [Japanese].

A quantitative genetical study was made of the F_0 and F_2 of the barley crosses Akashinriki [Red Shinriki] x Kabinkatagi, Kogoshima naked barley x Saga 1 naked barley and Ehime 1 naked barley x Kagawa naked barley. Heritability values were high for heading date, culm length and ear length but low for number of ears per plant, weight of ears per plant, weight of grains per plant, number of grains per ear and 1000-grain weight. Yield was not closely correlated with any character with high heritability and therefore selection for yield on the basis of the characters studied is not promising.

4216 KIRIYAMA, T. & KONISHI, T.
(**Studies on the effect of selection in barley breeding. II. Heritability and genetic correlations concerning characters of major importance and their application in breeding**).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1957 : **4** : 329–41. [Japanese].

Bulk populations and randomly selected lines of the F_3 of the second cross mentioned in the previous abstract were raised. Estimates of the D, H, E_1 and E_2 variance components for heading date, culm length, spike length, number of spikes per plant and weight of grains per plant were obtained, also genotypic, phenotypic and environmental correlations between these characters and expected rate of genetic advance from selection for earliness. Heading date has high heritability and little genotypic correlation with the other characters. Yield has comparatively low heritability but some progress might be expected from selection for weight of grains per plant.

4217 KUGLER, W. F., RATH, J. & KRUSE, G.
Descripción de variedades de cebada cultivadas en Argentina. (**Description of barley varieties grown in Argentina**).
Publ. téc. Estac. exp. Pergamino 1957 : No. 33 : Pp. 44.

The morphological and agronomic characters of 12 varieties are described and information on their history and parentage is given. Keys to the six-rowed and two-rowed varieties are included.

4218 SOSNA, M.
Kosmické záření jako faktor cytologických pochodů u *Hordeum Vulgare* L. (**Cosmic radiation and cytological processes in *H. vulgare* L.**).
Čsl. Biol. 1957 : **6** : 22–26.

The effects of cosmic rays on mitosis in the variety Stupický Hanák II were studied in 1951–3 at Prague and Skalnaté Pleso in the Tatra mountains. No differences were noted between uncovered plants grown at the two altitudes. When grown under 18 mm. or 10 cm. lead shields, however, the effects of radiation at the higher altitude on the mitotic index and on frequency of chromosome aberrations became evident. Indications were also found of differences between the effects of the hard and soft components of cosmic radiation.

4219 EHRENBERG, L., MOUTSCHEN-DAHMEN, J. & MOUTSCHEN-DAHMEN, M.
Aberrations chromosomiques produites dans des graines par de hautes pressions d'oxygène. (**Chromosomal aberrations produced in seeds by high oxygen pressures**).
Acta chem. scand. 1957 : **11** : 1428–30.

Chromosome breaks during metaphase and anaphase and bridges during anaphase were observed in the second mitotic division in root-tip cells of germinating barley grains after treatment of the dry grains with oxygen at a pressure of 60 atmospheres, the frequency of aberrations being greater for treatment lasting two weeks than for treatment lasting one week. Two weeks' treatment with nitrogen produced no radiomimetic effects.

4220 COENRADIE, J.
Proefmoutresultaten van enige rassenproefvelden van oogst 1956 en oogst 1957. (**Results of malting tests of some variety trial fields, harvest 1956 and harvest 1957**).
22e Nacobrouw Jb. 1958 : 95–99.

Details of malting quality are given for ten barley varieties grown in various localities in the Netherlands.

4221 TAKAHASHI, R. & AKAKI, H.
(**Fundamental studies on the cultivation and breeding of barley varieties for straw plait. II.**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1956 : No. 54 : 79–94. [Japanese]

Quality of straw plait depends primarily on the length of the upper two leaf sheaths. These two measurements are correlated both with each other and with the lengths of the two upper internodes and with total stem length. Data are provided on the above characteristics, Young's modulus (an index of flexibility), breaking strength, stem diameter, thickness of the stem wall, and anatomical characteristics of the straw of a series of Japanese and introduced varieties. Superior qualities were shown by the hulled varieties Bizenwase 36 [Early Bizen 36], Hachikoku and Hayakiso 2 and the naked varieties Goseshikoku 2 and Osaba 1.

4222 MACKAY, D. B.
A note on atypical collar type in Scandinavian barley varieties.
J. nat. Inst. agric. Bot. 1957 : **8** : 62–66.

Scandinavian barleys normally have ears with the platform type of collar. Investigations at the National Institute of Agricultural Botany, Cambridge, England, have shown that the occurrence of cupped collars in Scandinavian varieties, a feature typical of English barleys, does not necessarily represent admixture by the latter. This variation may arise through the effect of environmental conditions on individual tillers of plants often exhibiting the normal type of collar on other tillers. The tendency to develop atypical collars appeared to be greater in some varieties than in others. It is concluded that collar type remains a useful feature in varietal classification, although it should always be used in conjunction with other characters.

4223 Puia, I. & Bărbat, I.
Contribuţii la studiul rezistenţei la ger a orzului de toamnă. (**Contributions to the study of resistance to frost in winter barley**).
Stud. Cercet. Agron., Cluj 1957 : **8** : 43–73.

The relation between resistance to frost, on the one hand, and the content of soluble dry-matter in the cell sap, water-retaining power of the cells and bound-water content, on the other, was examined in a series of varieties differing in degree of winter hardiness. Resistance to frost was correlated with high dry-matter content, high water-retaining power and high content of bound water. The varieties Janetzki, Elfinger, Mandorfer and Cenad 396 are recommended for breeding winter-hardy varieties.

4224 Moseman, J. G. & Reid, D. A.
Reaction of spring and winter barleys to cultures of four races and culture P35 of *Ustilago nuda*.
Plant Dis. Reptr. 1958 : **42** : 614–17.

The four cultures respectively representing races 1, 2, 3, and 4 of *U. nuda* and the four differential varieties (Charlottetown, Compana, Valki and Golden Melon) used were the same as those studied by Tapke [XXV, 1992]. The differentials showed the same reaction to the four cultures as those reported by Tapke. Their response to culture 269 of race 1 and culture P35 (originally obtained from Kinroku Selection MoB467) was similar. A fifth variety, Ogalitsu, was however resistant to culture 269 and susceptible to P35. The latter may therefore be considered as a biotype of race 1. Eleven out of 13 spring varieties and selections and 4 out of 19 winter barleys were resistant or immune to the five cultures.

MILLETS AND SORGHUMS

4225 Chang, L.-P.
(Studies on flowering and hybridization technique in *Setaria*).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1958 : **9** : 68–76. [Chinese].

The earlier part of this paper describes the floral biology of *Setaria*. Hybridization technique, in particular hot-water and manual emasculation, are treated in the middle part. The last part presents F_2 and F_3 segregation data for several characters in respect of a number of intervarietal crosses. The principal breeding objectives are yield, earliness and drought resistance.

4226 Ratnaswamy, M. C. & Dhanaraj, L.
Improvement of Italian millet (*Setaria italica* Beauv.).
Indian J. Agron. 1957 : **2** : 5–11.

Crosses have been made at Coimbatore between selected strains of Co.2 and Co.3 and the performance of the progeny is briefly described here. Plaited panicle, lodging and shedding resistance and heavy tillering were found to be dominant with a positive correlation between tillering and yield. Two strains, SI5109/7 and SI5112/4, showing these characters, have been selected from the F_3 and both have given excellent yields, 170% and 151% respectively as compared with the standard variety.

4227 Veyret, Y.
Nombre chromosomique chez le *Pennisetum pseudotriticoides* A. Camus. (**The chromosome number of *P. pseudotriticoides* A. Camus**).
Agron. trop., Nogent 1958 : **13** : p. 128.

The chromosome number of *P. pseudotriticoides* was found to be $2n = 18$; the chromosomes are slightly larger than those of most species of *Pennisetum* with $n = 9$.

4228 Burton, G. W.
Cytoplasmic male-sterility in pearl millet (*Pennisetum glaucum*) (L.) R. Br.
Agron. J. 1958 : **50** : p. 230.

The above type of sterility has been found in *P. glaucum* at the Agricultural Experiment Station, Tifton, Ga. Data from crosses of 41 inbreds with plants carrying the cytoplasmic sterility indicated that about two-thirds of the lines carried restorers conferring complete fertility.

Georgia Hybrid 1, produced by sowing a mixture of four inbreds, has contained only about 65% of hybrid seed. The mixture of hybrid, selfed and sibbed seed may be expected to yield as well as entirely hybrid seed at a suitable rate of sowing.

Experimental single crosses outyielding Georgia hybrid 1 have however been produced. The cytoplasmic male sterility could be used in the production of seed of such crosses containing a high percentage of hybrids. When the crop is used for forage, fertility restorers would not be required, and the sterility would prevent the farmer from using F_2 seed.

4229 Sreeramulu, C.
The occurrence and inheritance of telescopic leaf-sheaths in sorghum.
Curr. Sci. 1958 : **27** : 59–60.

In *S. caudatum* 'Bonganhilo' from S. Africa, the leaf sheaths are two to three times longer than the internodes, successive sheaths telescoping into one another. In the cross of Bonganhilo with *S. durra* 'G3', a variety with normal sheaths, the telescoping type depended upon a single dominant gene (*Ls*).

4230 **White-seeded sorghum hybrid for Texas.**
What's New Crops Soils 1958 : **10** : No. 6 : p. 22.

This hybrid, designated RS630, has performed very favourably in tests in nine states and has given higher grain yields than any of the other hybrids under trial. The grain is ready for harvesting soon after it matures since the head is carried well above the upper leaf and dries out readily. It is medium early in maturity.

4231 Smeltzer, D. G., Miller, M. D. & Marble, V. L.
Hybrid grain sorghum trials.
Calif. Agric. 1958 : **12** : No. 5 : p. 3.

Hybrids tested in California generally outyielded the control variety not only under favourable conditions but also under such adverse conditions as soil salinity or drought.

4232 Hadley, H. H.
Chromosome numbers, fertility and rhizome expression of hybrids between grain sorghum and Johnsongrass.
Agron. J. 1958 : **50** : 278–82.

Several genetic stocks of the grain sorghum Texas Blackhull Kafir segregating for the male sterility gene ms_2 and a line of Combine Kafir 60 carrying cytoplasmic male sterility were used as the female parents in crosses with *S. halepense* from various sources. The F_1 hybrids were of the following types: (1) highly sterile with vigorous rhizomes and $2n = 30$; (2) self fertile with weak rhizomes and $2n = 40$ and (3) male sterile with weak rhizomes and $2n = 40$. A high frequency of type (1) hybrids was given by self-fertile mother plants of Texas Blackhull Kafir which had been emasculated by hot water Female parents with male sterility gave high frequencies of 40-chromosome hybrids; those derived from lines carrying genetic male sterility were of type (2). Type (3) hybrids came from mother plants of Combine Kafir 60 with cytoplasmic male sterility. The possibility of these various hybrids becoming troublesome weeds is discussed.

4233 Pierson, C.
Quelques considérations sur la culture du sorgho au Ruanda-Urundi. (**Some considerations of the cultivation of sorghum at Ruanda-Urundi**).
Bull. agric. Congo belge 1958 : **49** : 397–419.

Tabulated information on agronomic and quality characters of 12 local varieties is provided; the varieties are illustrated and characters which are easily recognized in the field are mentioned. These varieties are primarily grown to provide grain for flour and malting.

4234 **Grain sorghum with yellow interior now seems probable.**
What's New Crops Soils 1958 : **10** : No. 7 : 27–28.

At Oklahoma State University, promising sorghum selections with endosperm of high carotene content have been produced from crosses between the African variety Kaura and American varieties. Ten lines are now ready for field testing.

RICE

4235 **Use of confounded designs and fractional replications in testing variety x fertilizer interactions.**
FAO UN, Rome (Undated) : FAO/58/1/71 : Pp. 9. (Mimeographed).

Examples of confounded designs suitable for rice varietal trials involving up to 8 factors are given.

4236 Mello-Sampayo, T. & Duarte, A. S.
Notas sobre alguns problemas relacionados com o melhoramento do arroz. (**Notes on some problems related to the improvement of rice**).
Brotéria 1957 : **26** : 28–33.

A short review is given of rice breeding problems with special reference to Portugal. The topics touched upon include the introduction and testing of foreign varieties, hybridization between improved foreign varieties and locally adapted native varieties, resistance to blast, hybrid sterility and induced polyploidy.

4237 Adair, C. R., Cralley, E. M. & Johnston, T. H.
Long-time trends in grain yields of five rice varieties.
Agron. J. 1958 : **50** : 233–35.

Four of the rice varieties studied were grown for 28 years and one for 25 years. On account of varietal differences in reaction to diseases whose prevalence varied in different years, yield comparisons made over a seven-year period were not indicative of long-term relationships and long-term averages were not reliable predictions of the comparative yields to be expected during shorter periods of time.

4238 TAKAHASHI, M.-E.
Analysis on apiculus color genes essential to anthocyanin coloration in rice.
J. Fac. Agric. Hokkaido Univ. 1957 : **50** : 266–362.

From an analysis of a large number of crosses among Japanese and foreign varieties the author reaches the following conclusions concerning the inheritance of anthocyanin pigmentation. Two complementary and multiple-allelic loci, *C* and *Sp*, determine apiculus colour, *C* being responsible for the production of a precursor and *Sp* for its conversion into anthocyanin. Five alleles have been detected at *C* and three at *Sp*. The symbols and ranking according to dominance are as follows: $C^{B} > C^{Bp} > C^{Bt} > C^{Br} > C^{+}$ and $Sp > Sp^{d} > Sp^{+}$. An additional gene *A* brings about the uniform distribution of the pigment in the apiculus. Ranking for dominance of the *C* and *Sp* alleles corresponds to their respective potencies for precursor production and conversion. No qualitative differences were found in the pigment of the various genotypes, the aglycone of the anthocyanin being cyanidin in all cases. In order to explain the tawny colours of the apiculus, observed in some varieties at the time of ripening, the following suggestion is made. In the absence of allele *Sp* but in the presence of Sp^{d} or Sp^{+}, the chromogenic substance synthesized as the result of the action of a *C* allele may be transformed into a brown pigment, possibly flavonol or phlobaphane. The effects of all the different combinations of *C* and *Sp* alleles extend to the awns and empty glumes. *C* and *Sp* alleles high in dominance also have a pleiotropic influence on the coloration of some other parts. Anthocyanin pigmentation in parts other than the apiculus mainly depends however upon the alleles at *C* and *Sp*, together with three other genes *Rp*, *Pl* and *Pn* which affect the distribution of the pigment. *Rp* is responsible for the presence of anthocyanin in the lemma and palea and, in some cases, the rachilla. It also controls the tawny coloration of these parts. *Pl* (purple leaf) is concerned with the pigmentation of the leaf blade and sheath, pulvinus, auricle, ligule, node, internode and rachis, while *Pn* (purple node) governs anthocyanin production in the leaf apex and margin, node, pulvinus, auricle and ligule. The distributory action of these genes depends upon the combinations of *C* and *Sp* alleles, i.e. is associated with the intensity of apiculus coloration. The effect of *Pl* is diminished by *Ipl*, a gene inhibiting pigmentation in the centre of the lamina. Histological observations on the localization of pigment in the different genotypes are recorded. The author concludes that the data obtained on the genetics of anthocyanin pigmentation in rice by other investigators may be explained according to the system he proposes.

4239 SHAFI, M. & KHAN, S.
The inheritance of anthocyanin pigment in leafsheath, leafblade and stigma of paddy.
Pakist. J. sci. Res. 1958 : **10** : 34–42.

Investigations were carried out on crosses of the purple-coloured rice Babir from Kashmir and three local strains at the Rice Farm, Kala Shah Kaku, Sheikhupura District. Purple leaf sheath was dominant over green and dependent upon a single gene (*Ls*). Lamina colour was controlled by two genes which segregated to give an F_2 ratio of 13 green-leaved: 3 purple-leaved plants. One of the genes was *Ls* and the other an inhibitor (*H*). Purple colour of the stigma was dominant over white and determined by a single gene *St* which was closely linked with *Ls*.

4240 MATSUO, T.
(**Methods for breeding high-yielding rice varieties**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 641–46. [Japanese].

Recent Japanese work on the inheritance of quantitative characters acting as yield components is reviewed. Special attention is devoted to ear and grain characters, the effect of heterosis and selection technique. The original papers on which the survey is based have been summarized *passim* in *Plant Breeding Abstracts*.

4241 MORINAGA, T. & FUKUSHIMA, E.
Cytogenetical studies on *Oryza sativa* L. VII. Backcross progenies of the interspecific hybrids of *Oryza*.
Cytologia, Tokyo 1956 : **21** : 165–78.

The percentage of seed fertility of the matings (F_1 *O. sativa* x *O. minuta*) ♀ x *O. sativa* and

(F_1 *O. sativa* x *O. latifolia*) ♀ x *O. sativa* were respectively 0·14 and 1·21. The back crosses were highly sterile and in general resembled the maternal F_1 hybrids. They exhibited fairly wide variation, however, in ligule shape, spikelet length and shape of the terminal leaf blade, even among individuals derived from the same F_1 plant and the same variety of *O. sativa* constituting the back-cross parent. No adult plants were secured from (F_1 *O. minuta* x *O. latifolia*) ♀ x *O. minuta* or *O. latifolia*.

All back-cross plants had $2n = 48$ in their root-tip cells and underwent regular meiosis according to the *Drosera* scheme, 12_{II} and 24_{I} being formed. The majority of the embryo-sac mother cells degenerated before meiosis began. It has been postulated in a previous paper [XX, 1675] that the genomic constitutions of *O. sativa, O. minuta* and *O. latifolia* may be respectively designated as AA, BBCC and CCDD. It is suggested that the back-cross plants arose through fertilization of unreduced ♀ gametes and therefore had the constitution AABC (ABC + A) or AACD (ACD + A) according to whether *O. minuta* or *O. latifolia* was involved.

4242 Oka, H.-I., Hayashi, J. & Shiojiri, I.
Induced mutation of polygenes for quantitative characters in rice.
J. Hered. 1958 : **49** : 11–14.

Seeds of a pure line of the variety Kisshin were divided into three lots; two were subjected to X irradiation of 6000 r. and 12,000 r. respectively and the third was left untreated. The three populations were propagated in bulk up to the X_4 generation and then studies of heading date and plant height were made with 75 X_5 lines raised by random sampling from each population; during the experiment, all plants with recognizable changes were removed and only lines of normal appearance were studied. It was found that, while X irradiation increased genetic variability, the mean values for the two characters studied did not differ significantly in the three populations. It was therefore concluded that as a result of irradiation, polygenic mutations with plus and minus effects had occurred with about equal frequency. Burdick is said to have had similar results with *Drosophila*, this work being unpublished. X_5 lines showing extreme values in either plus or minus directions for either character were selected from each irradiation class; their progeny was tested and parent-offspring regressions were calculated. Plants which had received higher dosage of X rays tended to have higher heritability values.

4243 Katayama, T.
(Studies on chlorophyll mutants induced in rice by X rays. Differences in the free-aminoacid content of albino strains).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : p. 82. [Japanese].

Two types of albino mutants were obtained by X irradiating a glutinous rice variety, one characterized by a wide range in aminoacid content and the other by the presence of aspartic acid, glutamic acid and valine only.

4244 Ujihara, K.
(**The characteristics of Kimmase rice and advice on its cultivation**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 541–43. [Japanese].

The above variety was produced at the Aichi research station. It is of complex parentage, ripens in early September when sown in late June in lowland areas in Aichi and has a 1000-grain weight of 21·1–21·8 g.; it is susceptible to blast and bacterial leaf blight.

4245 Favero, A.
Nuove varietà di riso. (**New varieties of rice**).
Sementi elette 1958 : **4** : No. 1 : 59–60.

Descriptions are given of three varieties produced by the Stazione Sperimentale di Risicoltura [Rice Research Station] at Vercelli in Italy. Balocco is a hybrid from Agostano x R77, having grain of the common type, the dimensions after husking being 5·64 × 3·13 × 2·13 mm. Baraggia, from Agostano x (P6 x Blue Rose), has somewhat larger grain of dimensions 5·82 × 3·23 × 2·18 mm., is resistant to diseases and pests and stands well. Olcenengo is a selection from Lady Wright of the semifine type, with dimensions 6·58 × 3·31 × 2·17 mm., and is extremely disease resistant. All three varieties give good yields.

4246 Tarchetti, A.
Un nome vercellese per un riso importato dalla Cina (**A name from Vercelli for a rice imported from China**).
Riso, Milano 1958 : **3** : 18–20.

Early references to the Italian rice Bertone are cited; they show that its main characteristics were the same in 1829 as they are today. On the question as to whether it was identical with the rice Chinese, both of which were resistant to brusone, the evidence is still conflicting.

4247 Ting, Y.
(**The origin and differentiation of cultivated rice in China**).
Nung-yeh-hsueh Pao/Act. agric. Sinica 1957 : **8** : 243–60. [Chinese].

Two earlier papers on these topics have been summarized already [XX, 325 and XXI, 357]. Additional points dealt with in the present paper include the role of photoperiodism in racial differentiation and the evolutionary history of glutinous rice.

4248 Yamakawa, Y. & Kishikawa, H.
(**The effect of temperature on cell division and elongation of rice roots**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 94–95. [Japanese].

Cell division reaches its maximum at 25° C.; elongation is most rapid at 30° C. Cell division shows a marked diurnal periodicity with primary maxima at 10 a.m. and 10 p.m. and secondary maxima at 4 a.m. and 6 p.m.

4249 Krishnaswamy, N. & Chandrasekharan, P.
Note on a naturally occurring tetraploid species of Oryza.
Sci. & Cult. 1957 : **23** : 308–10.

A description is given of a tetraploid, provisionally designated *O. malampuzhaensis* after the locality where it was found, near Coimbatore, Madras. It is similar to *O. officinalis* in most characters but resembles *O. latifolia* in spikelet length and in possessing a fringe of fine hairs at the apex of the ligule. Crossing of the tetraploid with *O. latifolia*, *O. officinalis* and *O. sativa* is under way.

4250 Iwamoto, K., Hayashi, Z. & Tanaka, T.
(**Studies on vitamin B_1 in rice**).
Shiga Nogyo Daigaku Gakujutsu Hokoku/Sci. Rep. Shiga agric. Coll. : Ser. 1 : 1952 : No. 2 : 40–43. [Japanese].

Eight varieties were analysed. Shigaasaki 20 [Shiga Rising Sun 20] had the highest thiamin content, 473 γ% in the hulled grain, but was exceeded by four other varieties in the thiamin content of the endosperm.

4251 Banerjee, S. N. & Guha, B. C.
Thiamin values of pure-bred strains of rice.
Ann. Biochem. 1955 : **15** : 103–08.

The thiamin content of the grain of 89 Indian varieties was determined for the 1952–53 and 1953–54 crops. Varieties with more than 4·0 μg./g. of thiamin are set out in a separate table. The highest value, 6·0 μg./g., was found in strain T3 from Nagina.

4252 Polgár, S.
Néhány rizsfajta csíranövényének szívóereje. (**Suction pressure of germinating plants of some rice varieties**).
Növénytermelés 1957 : **6** : 209–16.

Data are given on the germination percentage, root and shoot length and suction pressure of seedlings of five varieties allowed to germinate in solutions of different osmotic pressures and pH, obtained by the addition of glucose and acid magnesium chloride to Knopp's solution. On the assumption that when the plant ceases to grow its suction pressure is equal to the osmotic pressure of the solution, suction pressure was found to vary at different stages of germination and in different varieties. Varietal differences in response to pH level are also noted.

4253 Takahashi, N.
Studies on the varietal difference in the velocity of germination of rice seeds.
Rep. Inst. agric. Res. Tôhoku Univ. : Ser. D. : 1956 : **7** : 1–15.

Ou 195, which germinates more rapidly than Ou 200, was found to have a correspondingly more rapid oxygen uptake than Ou 200 in the period prior to germination, although the total oxygen uptake of the two varieties during this period was the same. Similarly the water uptake of Ou 195 was more rapid but it is thought that the difference in oxygen uptake is of greater significance.

4254 Crescini, F.
Caratteri fisiologici nell'orbita del miglioramento genetico del riso coltivato in Italia. (**Physiological characteristics in the field of genetic improvement of the rice grown in Italy**).
Sementi elette 1958 : **4** : No. 1 : 36–39.

Reference is made to a breeding programme recently initiated in Italy, the object of which is to produce rice varieties capable of maturing in 110–120 days. For this purpose the Italian varieties are being crossed with a number of varieties introduced from abroad.

4255 Yü, C.-J. & Yao, Y.-T.
Über die Vererbung der Ausschusszeiten beim Reis. (**On the inheritance of flowering times in rice**).
Idengaku Zasshi/Jap. J. Genet. 1957 : **32** : 179–88.

Observations on date and duration of flowering were made at Taiwan for two parent varieties, Shinriki and Tai-chung 65, and their F_1, F_2 and F_3 progeny; the plants were grown as summer and winter crops. The ratio of early-heading to late-heading individuals was 3 : 1 for F_2 progeny grown in the first part of the year and 15 : 1 for the later crop. F_3 progeny descended from the first F_2 crop had a segregation ratio of 3 : 1 for plants with a long heading-period to those with a short heading-period. Also certain F_3 lines with late heading arose from early F_2 lines. These results are explained by assuming that two gene pairs influence flowering. Genes *Fl* and *fl* determine early and late flowering respectively and *Se* and *se* are responsible for sensitivity and insensitivity to photoperiod [cf. XXVI, 441]. Shinriki is thought to have the genotype *Fl Fl Se Se* and Tai-chung 65 *fl fl se se.*

4256 Brown, F. B.
Natural cross-pollination in rice in Malaya.
Malay. agric. J. 1957 : **40** : 264–68.

Using completely homozygous varieties, the amount of outcrossing was found to be 0·41%, an estimate which is in good agreement with that obtained by Larter (0·48%) [XXI, 364].

4257 Oka, H.-I.
Genic analysis for the sterility of hybrids between distantly related varieties of cultivated rice.
J. Genet. 1957 : **55** : 397–409.

The author explains his hypothesis that the sterility of hybrids between distantly related varieties may be explained on the basis of duplicate gametic-development (GD) genes, the double-recessive gametes deteriorating during development. Mainly with reference to work reported in several previous papers which have been summarized in *Plant Breeding Abstracts*, he gives as supporting evidence the results of crosses of the type (A x B) x C in which A and B are closely related varieties differing in the fertility of their hybrids with C. He also discusses on a theoretical and experimental basis the following situations: (1) the alteration, as the result of gametic selection, in the segregation ratio for a gene linked with a GD gene, and (2) the restriction imposed upon the recombination of two independent genes as a consequence of their respective linkages with two GD genes belonging to the same parental chromosome set. It is pointed out that several sets of GD genes, which may be regarded as polygenes, usually segregate in hybrids between distantly related varieties. In addition to the GD genes, various other duplicate genes for fertility appear to be present. Since it has been found that in tetraploid hybrids between distantly related varieties, the chromosomes derived from the same parent do not pair selectively, the origin of gene duplication is attributed to chromosome doubling, as suggested by the hypothesis that rice is a secondary polyploid, rather than to numerous small translocations. Finally, it is suggested that genotypes similar to the parents will increase in a hybrid population derived from strains possessing different duplicate genes for reproduction or growth, since recombination will tend to result in disadvantageous genotype which will undergo gametic or zygotic elimination. In mainly self fertilizing species, duplicate genes may therefore play a role in racial differentiation.

4258 Étude sur la translucidité du riz à Madagascar. (**A study on the translucence of rice in Madagascar**).
Riz et Rizic. 1958 : **4** : 10–17.

A method used in Madagascar for measuring the coefficient of translucence of rice grain is described. The expression of this inherited character is greatly influenced by the environment; a positive correlation between the thickness of the grain and the degree of chalkiness was found in a large number of varieties.

4259 Dufournet, R. & Rakotomanana
Essais de cuisson de riz à la Station agronomique du lac Alaotra (Madagascar) (**Cooking tests of rice at the Agronomic Station of Lake Alaotra, Madagascar**).
Riz et Rizic. 1958 : **4** : 18–33.

Tests were carried out with grain from 15 varieties and lines; cooking time increased with the weight and translucence of the grain. Information on the increase in size and weight during cooking and on the appearance, flavour and smell of the cooked rice is given for each variety. Makalioka **34** was the most palatable variety.

4260 Morinaga, T.
(**Chinese rice**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 513–16. [Japanese].

The classification and distribution of Chinese rice varieties is reviewed with special reference to the work of Kato. The various varietal groups of oriental rice proposed by Japanese investigators are compared and the equivalences between these and the rice types recognized in China are pointed out.

4261 Rajagopalan, K.
Studies on drought resistance in rice—part II.
Madras agric. J. 1958 : **45** : 29–54.

By testing germinating seeds in solutions of sucrose, sodium chloride, copper sulphate and potassium chlorate, drought resistant and susceptible varieties could be distinguished on the basis of percentage of surviving seedlings [cf. 531]. Use of sucrose (0·25–0·35 M) gave the most satisfactory evaluation. The osmotic values of cell-sap extracts from the leaves or roots showed no consistent relationship with drought resistance among the 12 early and medium varieties tested. Total transpiring surface as determined by leaf area and number did not influence capacity to withstand drought. Pot and field experiments indicated the importance of various characteristics of the root system, the number, total length and dry weight of the roots and root : shoot ratio being higher in resistant varieties. The reaction of the lowland rice Co.13 and upland type MTU17 to atmospheric drought in galvanized-iron drums was also investigated. The relative transpiration of each variety in a dry atmosphere was half that under humid conditions. The transparitional loss from Co.13 was however one and a half times that from MTU17 under both dry and humid conditions.

4262 Grillot, G.
Expérimentation rizicole. (**Rice experimentation**). Bull. Soc. Agric., Maroc 1956 : No. 68 : 18–28.

Brief notes are provided on varietal studies carried out in Morocco; some Japanese varieties were promising in respect of productivity and resistance to lodging.

4263 Arnoux, L.
Les principales variétés de riz d'Afrique Occidentale Française. (**The principal rice varieties of French West Africa**).
Riz et Rizic. 1958 : **4** : 41–47.

Descriptions are provided of the botanical and agronomic characters of 17 rice varieties; illustrations of the grain are included. At the Research Stations of Office du Niger and Richard-Toll, productive early and late varieties are being sought in order to extend the rice harvest over a longer period of time; selection for resistance to lodging is also in progress. In upper Guinea, the search is for varieties with a white caryopsis and resistance to flooding. Some of the varieties which have shown promise in trials held at the above three centres are mentioned.

4264 Yamaguchi, H., Shiratori, K. & Hatano, R.
(**Studies on technique of cultivation in connexion with the improvement of rice growing in badly drained fields. V. Studies on the physiological characters of rice varieties in connexion with resistance to autumn decline. 5. Varietal differences in the capacity of rice roots to oxidize H_2S**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **26** : 193–94. [Japanese].

Data are provided on the capacity of the roots of a series of Japanese varieties to oxidize H_2S. At high temperatures, but not at low, late varieties have a higher oxidizing capacity than early varieties. Capacity to oxidize H_2S, the Eh_6 value of the cell sap of the roots and resistance to autumn decline are positively correlated.

4265 Yoshii, H.
(**Studies of the disease resistance of rice**).
Ehime Daigaku Kiyo/Mem. Ehime Univ. : Sect. 6 : 1957 : **3** : 1–149. [Japanese].

The earlier parts of this paper describe investigations on the nature of varietal resistance to *Cochliobolus miyabeanus*; 59 Japanese and introduced varieties were studied. Resistance was associated in some cases with the presence of compact chlorenchymatous cells which do not become constricted after infection and of narrow intercellular spaces. Resistance was also associated with the presence of an acetone-soluble substance which inhibited the germination of the conidia of *C. miyabeanus*.

The later parts of the paper deal mainly with the effects of cephalothecin on *Piricularia oryzae*.

4266 Yoshimura, S. & Nishizawa, T.
(**Studies on methods of testing the varietal resistance of upland rice to *Pellicularia filamentosa* f. sp. *sasakii***)
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1954 : **2** : 361–78. [Japanese].

In field tests using artificial inoculation, late varieties proved more resistant than early. Varietal differences in resistance were not apparent after artificial inoculation of seedlings or detached leaf sheaths.

4267 Podhradszky, J. & Südi, J.
Rizsfajták "bruzone rezisztenciájának" szabadföldi elbírálása. (**Field determination of blast resistance of rice varieties**).
Növénytermelés 1957 : **6** : 239–48.

Suitable methods for ensuring maximum infection in field tests for resistance are described. It is noted that if infected after flowering, Precoce Allorio [Allorio Early] is as susceptible as Dunghan Shali, while if infected prior to flowering its leaves are resistant.

4268 Simon, J.
A magyarországi rizsbetegségek nemesítési vonatkozásai. (**Rice diseases in Hungary with reference to breeding**).
Növénytermelés 1957 : **6** : 183–88.

Details of the incidence of blast and other diseases at Kopáncs, Hungary, in 1954–55 are given, varietal differences being noted. The F_1–F_5 progeny of crosses involving 55 varieties in 108 combinations are under observation. The productive, high-quality variety Dunghan Shali has been chiefly used as one parent, the other parents being nonshattering, disease-resistant varieties also of good quality. Promising introduced varieties are also used in the crosses. Both Dunghan Shali and resistant varieties are being subjected to heat shocks and X-ray treatment to induce mutants and polyploids.

4269 Angladette, A.
Comptes Rendus de la Septième réunion du Groupe de Travail des Sélectionneurs et de la Sixième réunion du Groupe de Travail des Engrais de la Commission Internationale du Riz, tenues à Vercelli (Italie), 23–28 Septembre 1957. (**Reports of the Seventh Meeting of the Working Party of Breeders and of the Sixth Meeting of the Working Party on Fertilizers of the International Rice Commission, held at Vercelli, Italy, 23–28 September 1957**).
Riz et Rizic. 1958 : **4** : 48–53.

Brief accounts are given of papers from various countries. Certain *indica* varieties are said to have responded well to fertilizers. Attempts are being made to introduce dormancy into some varieties to prevent the grain from germinating whilst still in the panicles. At Cuttack in India and Manila, in the Philippines, varieties resistant to *Piricularia oryzae* were selected. As regards the International Programme of Rice Hybridization, crosses between *indica* types and varieties with agronomic characters intermediate between those of *indica* and *japonica* types are contemplated. Also mentioned are studies on the translucence and cooking quality of rice grain carried out in Madagascar (cf. 4258 and 4259].

4270 Yamada, W., Shiomi, T. & Yamamoto, H.
(**Studies on stripe disease of rice. II. On the occurrence and control of the disease**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1955 : No. 52 : 113–24. [Japanese].

A series of Japanese varieties were tested for degree of susceptibility but none are regarded as sufficiently resistant to afford adequate protection.

4271 Taziri, T. & Tsunekawa, K.
(**On early cultivation of irrigated rice varieties in unirrigated fields**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : p. 116. [Japanese].

Comparative data are provided on the yield and vegetative period of a set of irrigated and upland varieties grown under unirrigated conditions.

FORAGE GRASSES

4272 Ruebenbauer, Z.
Założenia hodowli traw. (**The bases of grass breeding**).
Postępy Nauk Roln. 1954 : No. **1** : 28–42.

The problems of grass breeding are surveyed, the chief topics discussed being methods of breeding for different purposes, type of initial material, and sexual and vegetative propagation in different species.

4273 Rasmussen, F.
Stammeforsøg med almindelig rajgræs og timothe 1953–1956. (**Strain trial of perennial ryegrass and timothy, 1953–56**).
Tidsskr. Planteavl 1958 : **62** : 185–207.
Stammeforsøg med almindelig rajgræs og timothe 1953–56. (**Strain trial of perennial ryegrass and timothy, 1953–56.**)
Ibid. 158 : **62** : 341–44.

Data are presented on the performance of 13 varieties of perennial ryegrass and six of timothy, tested at seven stations in Denmark.

4274 STURLA FRIDRIKSSON
Grasa- og belgjurtategundir í íslenzkum sáđtilraunum. **(Grass and legume species in Iceland sowing trials).**
Rit. Landbúnađardeildar : Ser. B. : 1956 : No. 9 : Pp. 51.

Notes and tables are given on the performance of the best strains of numerous grass and legume species in trials held in Iceland since the beginning of the century.

4275 CALLAGHAN, F. R.
Pasture research and development in New Zealand, 1933–57.
Emp. J. exp. Agric. 1958 : **26** : 152–68.

During the years under review considerable progress has been made in breeding improved strains of ryegrass, cocksfoot, white clover and other pasture species.

4276 MARKARIAN, D. & SCHULZ-SCHAEFFER, J.
A possible origin of supernumerary fragment chromosomes.
J. Hered. 1958 : **49** : 3–7.

Alopecurus pratensis, *Anthoxanthum odoratum* and *Secale montanum* have been said by various authors to have supernumerary chromosomes. From a study of root-tip chromosomes in these species, it was found that fragments may arise during cytological manipulation by disarticulation at secondary constrictions. In the case of *A. pratensis*, three of the six plants studied did not have the easily disarticulated satellite on chromosome 5 that was found in the others and also the secondary constriction was not observable. The presence or absence of a weak secondary constriction appeared to be facultative in *A. pratensis*.

4277 BROWN, W. V. & EMERY, H. P.
Apomixis in the Gramineae: Panicoideae.
Amer. J. Bot. 1958 : **45** : 253–63.

"Sections of 7,765 ovules of 311 accessions of 164 species in 64 genera of 16 tribes of the Gramineae were examined for embryo sac structure and apomixis. Two types of embryo sacs were found: the 8-nucleate, 7-celled *Polygonum* type that is characteristic of all sexually reproducing grasses and one diplosporous species (*Tripsacum dactyloides*), and the 4-nucleate type that is associated with apospory and diplospory. There are now known to be 72 species of grasses that have the agamospermous type of apomixis and 11 additional species that reproduce, at least sometimes, by vivipary. In the subfamily Panicoideae apomixis was found in 28 per cent. of the species examined and all but one apomictic species formed 4-nucleate embryo sacs. It is concluded that apomictic Panicoideae form 4-nucleate embryo sacs, and, conversely, that 4-nucleate embryo sacs are unreduced. It is proposed that apomixis has been a characteristic of the subfamily since soon after its divergence from other Gramineae and before its diversification into its present constituent tribes; that there is a common pool of apomictic genes for the whole group; and that apomixis has been playing an important part in the evolution of species and species groups since some time during the Cretaceous period."
[Authors' summary].

4278 BROWN, W. V.
Leaf anatomy in grass systematics.
Bot. Gaz. 1958 : **119** : 170–78.

On the basis of leaf anatomy and plastid function, the following six basic types of tissue arrangement were distinguished among 101 species in 72 genera: bambusoid, festucoid, arundoid, panicoid, aristidoid and chloridoid. The characters considered to be of phylogenetic value are: (1) presence or absence of an endodermis, (2) structure and function of the parenchyma sheath, (3) arrangement of the chlorenchyma cells between the bundles, and (4) physiological aspects associated with (2) and (3). The author gives an evolutionary scheme for groups of tribes, based almost entirely on leaf anatomy. It corresponds to schemes proposed by other investigators according to different criteria. The types of leaf anatomy may be correlated with certain environmental conditions typical of the regions usually occupied by the grasses in the various groups. It is postulated that the most specialized types of leaf anatomy, the chloridoid and aristidoid, may be effective in adaptation to high temperature, high intensity of light and drought.

4279 HOVIN, A. W.
Meiotic chromosome pairing in amphihaploid *Poa annua* L.
Amer. J. Bot. 1958 : **45** : 131–38.

Four haploids ($2n = 14$) differed in amount of chromosome pairing. In the case of three of the haploids this variation was related to fluctuation in temperature. A mean increase of 1_{II} per PMG resulted from an increase of 11° C. in minimum night temperature. The enhanced amount of pairing was interpreted as representing association of nonhomologous chromosomes. Even at low temperature (7·5° C.) or during the winter (Los Angeles), a mean bivalent formation corresponding to 20% of the theoretical maximum of 7_{II} was recorded. As indicated by observations on pairing in F_1

hybrids of chromosome-doubled plants produced by treating the haploids with colchicine, no structural differences existed between the chromosome complements of the haploids. No evidence was therefore obtained that the putative ancestors of *P. annua*, viz. *P. informa* and *P. supina*, are highly differentiated.

4280 Kelly, A. F.

A comparison between two methods of measuring seasonal growth of two strains of *Dactylis glomerata* when grown as spaced plants and in swards.

J. Brit. Grassl. Soc. 1958 : **13** : 99–105.

In connexion with the problem of the technique of selection, the seasonal growth of S143 and von Kamekes was evaluated on the basis of (1) measurement of the leaf-plus-shoot length of spaced plants and (2) the dry-matter yield of the produce of sward plots. Significant positive correlations were obtained in early spring between (1) and (2). Subsequently no agreement was found between the two methods, some significant negative correlations being obtained. The data suggested that (*a*) in spring the main factor contributing to yield was shoot elongation, with the majority of tillers in the reproductive phase, (*b*) in summer the chief factor was new tiller formation, and (*c*) in the early autumn neither of these factors was predominant in contributing to yield.

4281 Cleveland, R. W. & Fortmann, H. R.

Pennlate orchardgrass—a new late maturing variety.

Sci. Fmr., Pa. 1957–58 : **5** : No. 3 : p. 10.

Developed at the Agricultural Experiment Station of Pennsylvania State University, the above synthetic of cocksfoot gives high yields of forage and matures about ten days later than the ordinary type.

4282 Cocks, B.

The influence of date of sowing and of strain on head production in timothy.

J. Brit. Grassl. Soc. 1958 : **13** : 92–98.

A study was made of the heading behaviour of seven strains of *Phleum pratense* and one strain (S50) of *Ph. nodosum* in the years of sowing and first harvest, when sown on a series of dates between March and August at the Welsh Plant Breeding Station, Aberystwyth. All strains produced heads in the sowing year. Only a very few plants failed to head when sown between 18 March and 29 April. With subsequent dates of sowing the proportion of plants heading progressively declines, most markedly in S50 and least in the early-heading strains of *Ph. pratense*. The environment to which the later sowings were exposed differed from that of the earlier-sown lots in two ways: (1) the initial temperatures were higher and initial day lengths longer, and (2) the decline in day length occurred at an earlier stage in development. One or both of these factors must have been responsible for failure of heading with later sowing. The sequence of heading dates among the strains in the sowing year differed considerably from that in the same plants after overwintering, suggesting the effect of some factor other than photoperiod in determining heading date in the sowing year. Variability in heading date within the strains was much greater in the sowing year than after overwintering and increased with lateness of sowing.

4283 Cooper, J. P.

The effect of temperature and photoperiod on inflorescence development in strains of timothy (*Phleum* spp.).

J. Brit. Grassl. Soc. 1958 : **13** : 81–91.

Investigations were carried out at the Welsh Plant Breeding Station, Aberystwyth, to determine the temperature and photoperiod required for flowering by strains of *Ph. pratense* from North America, the British Isles and northern continental countries, and by strains of *Ph. nodosum* developed in Wales. All the strains had a long-day requirement and failed to show any winter requirement for low temperature (0–5° C.). Head initiation in the greenhouse may however be inhibited by high temperature, even with adequate photoperiod. The effect of high temperature varied with the strain and appeared to be related to the May temperature of the region of origin. With greenhouse temperatures of 55–65° F., commercial strains from North America showed little inhibition of flowering, whereas many plants of the Scandinavian strains failed to produce heads. At this range of temperature the British hay strains were intermediate in heading behaviour but only an occasional plant of the pasture strain S50 (*Ph. nodosum*) headed.

4284 Walters, M. S.

Aberrant chromosome movement and spindle formation in meiosis of Bromus hybrids: an interpretation of spindle organization.

Amer. J. Bot. 1958 : **45** : 271–89.

Investigations were carried out on *B. mollis* x *B. carinatus* ($2n = 42$), *B. rubens* x *B. carinatus* ($2n = 42$) and *B. tectorum* x *B. carinatus* ($2n =$

35). During metaphase I the numerous univalents moved to the poles and then returned to the equator, with the spindle undergoing corresponding increase and decrease in length. Differences between the three hybrids, anthers from the same plant and the microsporocytes of individual anthers with respect to duration of metaphase I were observed. Anaphase might begin at any time during the return of the univalents to the poles. When anaphase was too long delayed, the chromosomes tended to remain at the equator and form a restitution nucleus at telophase I. Supernumerary cell division occurred during prophase II chiefly in those microsporocytes with restitution nuclei. Microsporocytes at metaphase II ranged from one cell with one spindle to clusters of six cells and six spindles, dyads occurring most commonly and triads being next in frequency. The extra spindles were functional, the chromosomes proceeding to the poles in a normal manner at anaphase II. It is suggested that genic interaction was responsible for the aberrant movement of the chromosomes at metaphase I, by causing a disturbance in the normal timing of the meiotic cycle. Genetic disparities between the hybrids may influence duration of metaphase, which may be further affected by the internal environment of the plant or single anther. The occurrence of multiple spindles is interpreted as follows. Spindle formation in *Bromus* depends on the combined activity of spindle organizers and the centromeres. The spindle organizer is regarded as a compound structure, as a rule functionally single and undergoing a regular cycle of division, but capable of supernumerary division under abnormal conditions into substructures which may also be effective in spindle organization.

4285 COPEMAN, G. J. F., HEDDLE, R. G., HUNT, I. V. & SAMPFORD, M. R.
Perennial ryegrass strains in Scotland.
Scot. Agric. 1958 : **37** : 195–202.

The trials described were carried out at Auchincruive, Boghall and Muchalls, using six strains. Details of total dry matter yield, total seasonal growth, spring production and midseason and late-season growth are presented and discussed, with notes on the characters of the strains.

4286 KUCHAŘ, F.
Pícninářské využití mezidruhového křížence jílků. (**Agronomic utilization of an intervarietal cross of ryegrass**).
Za socialist. Zeměd. 1957 : **9** : 541–47.

A morphological description is given of a cross between Italian and perennial ryegrass and its value for forage is discussed. Extensive field trials of it are in progress.

4287 REYNTENS, I. H.
Station de Recherches de l'État pour l'Amélioration des Plantes de Grande Culture, à Lemberge (autrefois à Melle). Le ray-grass anglais type à pâturer R.V.P. [**The State Research Station for the Improvement of Crop Plants at Lemberge (previously at Melle). The RVP pasture type of ryegrass**].
Rev. Agric., Brux. 1958 : **11** : 442–44.

The above variety has been most successful during the last ten years in Belgium and elsewhere on account of its vigour, tillering capacity and persistence; it also has good resistance to cold and rusts.

4288 **Norlea—perennial ryegrass.**
Seed Scoop 1958 : **4** : No. 3 : p. 6.

The most important characteristic of this variety is its winter hardiness, enabling it to survive and produce good fodder in areas where the growing of ryegrass has not previously been possible. It is leafy, yields well, and matures rather later than shorter varieties. It gives good seed yields. Although it is susceptible to leaf rust in some areas this does not appear to affect its yield.

4289 WIT, F.
Tetraploid Italian ryegrass (*Lolium multiflorum* Lam).
Euphytica, Wageningen 1958 : **7** : 47–58.

Small-scale experiments on C_2 and C_3 generations of tetraploid Italian ryegrass are described. In all cases the tetraploids had a lower dry-matter content than the diploids. C_3 mass selections equalled or surpassed the diploid mother strains in dry-matter yield on several soil types in the first year, but were less leafy and reduced in stand in the second year, even after a mild winter. By maternal-line selection, C_2 and C_3 families were obtained which were superior to the diploid strains in rate of initial development and spring growth, winter hardiness, leafiness, and resistance to fungus attack and bad weather. Several of these families, as well as a synthetic based on some of them, produced more dry matter than the diploids in both the first and second year. Families selected for fertility and forage yield exceeded the diploids in number of spikelets per ear, number of seeds per spikelet, 1000-seed weight and seed yield per m^2.

The possibility of using tetraploid Italian ryegrass on a commercial scale is discussed; special methods of management and special mixtures may be required if the best results are to be obtained.

4290 PETERSEN, R. G., WESWIG, P. H. & COWAN, J. R.
Measuring palatability differences in tall fescue by grazing sheep.
Agron. J. 1958 : **50** : 117–19.

Consistent differences in palatability were demonstrated among 20 genotypes of *Festuca arundinacea* by observations on the behaviour of sheep allowed to graze a replicated small-plot nursery. The differences were particularly marked during the season of the most rapid growth. Estimation of dry-matter consumption on the basis of the difference in forage weight of portions clipped before and after grazing gave unreliable estimates of palatability, chiefly because of the sampling errors involved.

4291 BEETLE, A. A.
***Piptochaetium* and *Phalaris* in the fossil record.**
Bull. Torrey bot. Cl. 1958 : **85** : 179–81.

Reasons are given for assigning two fossil grasses found in the Tertiary Florissant beds in Colorado to the above two genera. This interpretation is briefly discussed in relation to the possible distribution of representatives of the genera in geological times.

4292 **New Zoysia hybrids.**
What's New Crops Soils 1958 : **10** : No. 6 : p. 22.

Kansas State College has announced the development of two hybrids giving performances superior to that of Meyer. They will be tested further before release.

4293 CELARIER, R. P.
Cytotaxonomy of the Andropogoneae. 1. Subtribes Dimeriinae and Saccharinae.
Cytologia, Tokyo 1956 : **21** : 272–91.

The author reviews the literature on the cytology of the Saccharinae and incorporates some information obtained from his own investigations on the subtribe at the Oklahoma Agricultural Experiment Station. Data on chromosome numbers and meiosis are reported for the first time in the case of three genera, *Eccoilopus*, *Spodiopogon* and *Eulalia*. Polyploidy has been detected in every genus of which more than one species has been studied. Observations on meiosis suggest that the polyploid species are genomic or segmental allopolyploids. Several instances of intraspecific polyploidy, chiefly in *Erianthus*, have also been detected; their origin is not satisfactorily explained by allopolyploidy. All representatives of the subtribe have small chromosomes but some genera have smaller chromosomes than others; there appears to be a phylogenetic trend from larger to smaller chromosomes. The problem of basic chromosome number is considered and, on the basis of cytological and morphological features, an evolutionary scheme is proposed for the subtribe.

No cytological information is yet available on the single genus *Dimeria* representing the Dimeriinae.

4294 CELARIER, R. P. & HARLAN, J. R.
The cytogeography of the *Bothriochloa ischaemum* complex. Gramineae. I. Taxonomy, and geographic distribution.
J. Linn. Soc. 1958 : **55** : 755–60.

With reference to the literature, the geographical distribution and taxonomy of the above species are surveyed. A study of 57 samples grown at the Oklahoma Agricultural Experiment Station [cf. XXVII, 1856] and representing almost the entire range of distribution of the species has led to the recognition of two morphological types, respectively designated var. *ischaemum* and var. *songarica*. A chromosome number of $2n = 40$ was found in most samples of the former, with the exception of two, with $2n = 60$. In var. *songarica*, $2n = 50$ or 60.

4295 CELARIER, R. P.
Cytotaxonomic notes on the subsection *Halepensia* of the genus *Sorghum*.
Bull. Torrey bot. Cl. 1958 : **85** : 49–62.

A brief review is given of the taxonomy and geographical distribution of species belonging to subsect. *Halepensia*, together with more detailed information on their cytology. *S. propinquum* was found to be tetraploid ($2n = 20$), whereas *S. halepense*, *S. miliaceum*, *S. controversum* and *S. almum* had $2n = 40$. All the $8x$ species showed some meiotic irregularities, such as univalents and multivalents at metaphase I and laggards at anaphase I. Interspecific disparities in the frequency of irregularities were however noted, *S. miliaceum* and *S. controversum* being the most regular, *S. halepense* intermediate and *S. almum* the most irregular. *S. propinquum* was crossed with the tetraploid species *S. sudanense* and *S. vulgare* in subsect. *Arundinacea*. The F_1 hybrids were completely regular in meiosis. It is postulated that the progenitor of the 40-chromosome members of subsect. *Halepensia* may have arisen in south-east Asia as the result of doubling of the chromosome complement of a hybrid between *S. propinquum* and $2n = 20$ species of subsect. *Arundinacea*. By segregation and selection, it is further suggested, several 40-chromosome types became more or less stabilized. The Mediterranean species *S. halepense* may be the product of introgression with an African species in subsect. *Arundinacea*, while in very recent times *S. almum* may have originated through further introgression into *S. halepense* by some species of the last-mentioned subsection.

4296 Bonvicini, M.
Contributo al miglioramento genetico del sorgo sottile (***Sorghum exiguum*** Forsk.) [**Contribution towards the breeding of Sudan grass (*S. exiguum* Forsk.)**].
Sementi elette 1958 : **4** : No. 1 : 25–35.

By selection from material raised from commercial seed some 448 types have been isolated, differing in height, time of maturity, leaf breadth, number of leaves, tillering, form of panicle, glume colour, and awning. The highest yields in trials in different parts of Italy were given invariably by the late-maturing tall lines and the two best, after further selection, were named Satiro [Satyr] and Saturno [Saturn]; both are resistant to the main diseases and Saturno has given yields of 500–600 c. of green matter in the first cut, with almost equal amounts in three successive cuts when grown under favourable conditions. When moisture is a limiting factor Satiro, which is not quite so late, often gives the better yields. With irrigation 4–5 cuts a year can be obtained, with total yields of 1400–1500 c. per ha. No sign of toxity has ever been detected in the green fodder from either variety.

4297 **Jowar—our easy-to-grow fodder.**
Indian Fmg. 1958 : **8** : No. 1 : 29, 31–33.

Brief descriptions are given of varieties and strains of forage sorghum grown in different Indian States.

4298 Sazanov, V. I. & El'čaninova, N. N.
(**Some questions on the biology of Sudan grass**).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin. (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 12 : 9–13. [Russian].

Tabulated data on seed set at Kujbyšev after the following modes of pollination are presented: (1) flowers unemasculated, (*a*) bagged, (*b*) open pollinated; (2) hermaphrodite flowers emasculated, male flowers left intact, (*a*) bagged, (*b*) open pollinated; (3) male flowers removed, hermaphrodite flowers left intact, (*a*) bagged, (*b*) open pollinated; and (4) hermaphrodite and male flowers emasculated, open pollinated.

4299 Hedberg, O.
Cyto-taxonomic studies in Scottish mountain plants, notably *Deschampsia caespitosa* (L.) PB., s. lat.
Svensk bot. Tidskr. 1958 : **52** : 37–46.

While *D. alpina* and *D. caespitosa* are fairly distinct in Scandinavia, in Scottish material there is a continuous transition between the two, in degree of polyploidy, vivipary and other morphological characters. The data suggest that *D. alpina* may have originated polyphyletically from several races of *D. caespitosa* by polyploidization.

4300 **Butte and Trailway sideoats grama.**
What's New Crops Soils 1958 : **10** : No. 7 : p. 27.

The University of Nebraska Agricultural Experiment Station and the US Department of Agriculture have released two new varieties, both suitable for pasture mixtures grown during the warm season. Butte is an early variety recommended for soils of low fertility in high regions, where the growing season is short; the seedlings are vigorous. Trailway is a later variety requiring a longer growing season and fertile soil.

4301 Harlan, J. R.
Blue grama types from west Texas and eastern New Mexico.
J. Range Mgmt. 1958 : **11** : 84–87.

Information is given on the flowering habits, forage yields and other features of collections of *Bouteloua gracilis*. The results of a cytological study of this material have been reported elsewhere [XXIV, 1166].

4302 Church, G. L.
Artificial hybrids of *Elymus virginicus* with *E. canadensis*, *interruptus*, *riparius*, and *wiegandii*.
Amer. J. Bot. 1958 : **45** : 410–17.

The morphological and cytological characteristics of hybrids involving the above tetraploid species ($2n = 28$) are described. *E. virginicus*, represented by both typical and atypical strains, produced vigorous and intermediate F_1 plants in crosses with *E. canadensis*, especially when the parents originated from widely separated regions. Hybrids of typical *E. virginicus* from Ontario as ♀ with *E. canadensis* from Texas or *E. interruptus* from this state inherited the earlier time of anthesis of the ♂ parents. Failure to produce spikes was of frequent occurrence in hybrids of *E. virginicus* x *E. riparius* and

E. canadensis x *E. riparius.* Observations on hybrids between strains of *E. riparius* suggested the possibility of the presence of recessive factors for inhibition of flowering in this species. Spikes were however produced by *E. interruptus* ♀ x *E. riparius* ♂, the highly sterile F_1 plants showing considerable reduction in glume development. Evidence of partial lack of chromosome homology was found in *E. virginicus* x *E. riparius.* The neocentric behaviour of the chromosomes at meiosis in *E. wiegandii* was transmitted to hybrids between this species and *E. virginicus.* Meiotic irregularities such as partial lack of chromosome homology and formation of endopolyploid sporocytes are however considered to be chiefly responsible for sterility in the F_1 and F_2. The death of F_1 seedlings from *E. canadensis* x *E. wiegandii* was associated with intense anthocyanin pigmentation of the leaves after 1–3 months. In spite of the high degree of sterility of *E. virginicus* x *E. canadensis* and the failure to obtain fertile back crosses, variants departing from typical *E. virginicus* are probably in many cases the result of introgression with *E. canadensis* rather than with any of the other species studied.

4303 Sarkar, P.
A new diploid form of *Haynaldia hordeacea* Hack.
Wheat Inform. Serv. Kyoto 1957 : No. 6 : p. 22.

A form of *H. hordeacea* with $2n = 14$, instead of the usual $2n = 28$, has been found in Morocco in a collection which also included tetraploids and it is suggested that these plants are autoploid derivatives of the tetraploid and that the diploid represents the ancestral type.

4304 Chu, K. H., Yang, C. F. & Chang, F.
(A report of observations on the mode of flowering of *Agropyron elongatum*).
Nung-yeh-hsueh Pao (J. Agric.)/Act. Agric. sin. 1958 : **9** : 64–67. [Chinese].

The floral biology of the above species is described. At Peking, opening of the florets principally occurs at 16–17 hr.

4305 Tateoka, T.
On morphological convergence between *Brachypodium sylvaticum* and *Agropyron yezoense*.
Cytologia, Tokyo 1956 : **21** : 146–52.

Resemblances between the spikes and spikelets of the above two species are described. Comparison of the chromosomes of *Brachypodium* spp. with those of *Agropyron* spp. suggests that these resemblances are the result of convergent evolution.

LEGUMINOUS FORAGE PLANTS

4° Riunione annuale della Società Italiana di Genetica Agraria (Recoaro, 10–11 giugno 1957). [**Fourth annual meeting of the Italian Society for Agricultural Genetics (Recoaro, 10–11 June 1957)**].
Genet. agr. 1958 : **9** : 248–306.

The following papers were presented.

4306 *Fyfe, J. L. Breeding lucerne for English conditions. (pp. 248–59).*

Some account is presented of the breeding of lucerne at the Cambridge Plant Breeding Institute. The polycross method is being used to select from north European varieties a type which will give at least three good cuts per year and with maximum yields in the early part of its life. Some disadvantages of the polycross method are mentioned; these include slowness and greater opportunity for self pollination amongst parental clones. On the other hand, the method is simple, the progeny are tested under conditions similar to those of farm practice and large quantities of seed are produced. It is hoped to produce a more persistent variety for less intensive use with stems finer than those of Flamande so that cutting may be delayed without the herbage becoming coarse. For this purpose crosses were made between *M. falcata* and *M. sativa* 'du Puits' and back crosses made to du Puits; some promising forms were found amongst the second and third backcross generations. A Persian wild form is being used in a similar breeding programme. The author considers lucerne to be an autotetraploid and some of the implications of tetrasomic inheritance and relational incompatibility as regards inbreeding are considered.

4307 *Christidès [Khristides], B. G. La culture de la luzerne en Grèce. (The cultivation of lucerne in Greece). (pp. 260–65).*

In this review, a brief mention is made of varietal testing carried out by the Forage Plant Research Station. Notes are given on three varieties of foreign origin recommended for different parts of Greece.

4308 *Panos, D. A. Lucerne and its problems in Greece. (pp. 266–83).*

Information is presented on the general performance in Greece under various cultural conditions of lucernes from a number of sources.

4309 *Almeida, J. M. de. Progressos na cultura da luzerna em Portugal.* (*Progress in lucerne cultivation in Portugal*). (*pp. 284–89*).

Efforts to improve lucerne cultivation in Portugal have included trials with varieties of varying provenance, the best results having been given by Grimm from Canada, Marchigiana, Italia Centrale and Venetia from Italy, Île de France, Poitou and du Puits from France, Buffalo from the USA and African 153 from Israel.

4310 *Lackamp, J. W. La culture et la sélection de la luzerne aux Pays-Bas.* (*Cultivation and breeding of lucerne in the Netherlands*). (*pp. 290–96*).

In Holland, selection for the following properties is in progress: (1) a high yield of dry matter and protein; (2) resistance to cold; (3) persistence; (4) suitability for frequent cuttings and (5) tolerance of sandy soils with a low calcium content. Of the many foreign types tested in Holland, varieties from northern France have proved most satisfactory; the variety Rhizoma is mentioned for its persistence.

4311 *Botazzi, G. Considerazioni riguardanti il miglioramento dell'erba medica in Italia.* (*Considerations concerning the improvement of lucerne in Italy*). (*pp. 297–300*).

Notable increases in yield have been attained as a result of manuring but the extreme regional adaptation of the lucerne races grown in Italy is pointed out and reference is made to a scheme instituted by the speaker for their preservation and use for seed production. Selections from populations in the province of Lazio are being reproduced by the polycross method; confidence is expressed as to the superiority of the hybrid seeds but some doubt as to whether the demand from growers will justify the expense of producing it.

4312 *Ballatore, G. P. & Schicchi, S. Aspetti agronomici e genetici della coltura dell'erba medica* (Medicago sativa) *in Sicilia.* [*Agronomic and genetic aspects of the cultivation of lucerne* (M. sativa) *in Sicily*]. (*pp. 301–06*).

French ecotypes such as Provence and du Puits have proved better than Italian selections for cultivation under irrigation. For growing without irrigation trials are being made of 25 ecotypes; the best results are given by those that grow quickly in the winter season, such as Indian, African, Chilean, Caliverde, Autriche [Austrian] and Marchigiana.

Atti del 1° Convegno Nazionale sulla Coltura dell'Erba Medica. Lonigo, 9 giugno 1957. (**Proceedings of the 1st National Meeting on Lucerne Cultivation. Lonigo, 9 June 1957**).
Genet. agr. 1958 : **9** : 1–247.

The following contributions contained matters of interest to plant breeders.

4313 *Haussmann, G. Il valore agronomico di forme e razze di erba medica.* (*The agronomic value of forms and varieties of lucerne*). (*pp. 9–48*).

The hybrid nature of the cultivated lucernes, in which *Medicago falcata* and possibly *M. gaetula* and other species have crossed with *M. sativa*, is thought to be the reason for their wide range of ecological adaptation, the existence of which makes the question of seed provenance particularly important. Reference is made to tests of ecotypes carried out in Great Britain, France, the USA, the USSR and Italy. Some unpublished data on tests in Italy are reported, from which it is seen that two main groups exist, the northern and the southern; those from most points north of Bologna belong to the former group, in which the correlation between rainfall and yield is more marked than in the southern group. Better results were obtained when northern strains were grown further south than when those from the south were grown further north. A further set of observations was started in 1955, six lucernes from different parts of Italy being tested in five different parts of the country. Certain morphological differences between some of the ecotypes have already been detected, though few if any were correlated clearly with the differences in yield of green matter, which amounted to as much as 20% in some years; the ecotypes are also showing differences in the time at which they reach their maximum productivity. The highest yield was not always given in any particular locality by the ecotype of that region and in several places selection 202 from the Pasture Research Station at Lodi exceeded all others.

In the international trials organized by the OEEC the French and Flemish lucernes represented by Flamande, du Puits and Harmignies have proved more disease resistant and higher in yield than varieties from the USA and more disease resistant than the Italian varieties though inferior in yield, particularly to selection 202. Italian studies have not confirmed the correlation between protein content, carotene content and leafiness reported by certain other investigators.

In an appendix outlining the main methods of lucerne breeding it is mentioned that some synthetic varieties produced in the USA are at present being tested in Italy.

4314 *Grimaldi, A., Ribaldi, M. & Panella, A. Osservazioni e ricerche sull'erba medica in relazione ad alcuni aspetti del miglioramento e della difesa della cultura. (Observations and research on lucerne in relation to some aspects of breeding and plant protection). (pp. 49–67).*

In trials carried out in 1953-56 in the vicinity of Perugia with 23 introductions and the local Umbrian lucerne only du Puits was significantly superior to the local strain in forage yield in all four years; Atlantic from the USA and San Martín from Argentina were slightly superior but the difference was not significant. Indian from the USA exceeded Umbrian in the first year but fell off badly in succeeding years; it was also deficient in cold resistance. The cold-resistant varieties such as Ranger, Narragansett and Northern Synthetic had a lower proportion of diseased plants at the end of the four-year period than the less hardy types. A study of the diseases showed them to be caused by *Flavobacterium vasculorum*, *Aerobacter luteum* and certain other bacteria, *Fusarium oxysporum* and, occasionally, *Verticillium albo-atrum*. American varieties such as Ranger, Caliverde, Vernal and Lahontan, said to be resistant to *Corynebacterium insidiosum*, did not prove entirely resistant to the above bacterial infections, though they were less severely attacked than varieties not resistant to *C. insidiosum*.

4315 *Toniolo, L. Analisi dei caratteri per la identificazione di un ecotipo di* Medicago *spp. L. (Analysis of characters for the identification of an ecotype of* Medicago *spp. L.). (pp. 71–83).*

The difficulty of classifying the cultivated lucernes is ascribed partly to their wide ecotypic variation and partly to the frequency of crossing between *M. sativa* and *M. falcata*; an attempt has been made to classify the Italian lucernes according to seed shape, root system, branching, growth habit, stem diameter, pubescence, internode number, form of leaflets, leafiness, flower colour, pod shape and a number of physiological characters including longevity, time of flowering, spring, autumn and winter growth and cold resistance.

4316 *Maliani, C. Valore commerciale degli ecotipi di medica. (Commercial value of lucerne ecotypes). (pp. 85–90).*

Figures are given showing the increasing use of lucerne seed of certified provenance in Italy in the last few years and reference is made to the desirability of legislation to make it necessary to colour imported seed.

4317 *Trentin, A. Per il miglioramento della coltura dell'erba medica. Ricerche e osservazioni di un quinquennio. (Towards the improvement of lucerne cultivation. Research and observations over five years). (pp. 91–143).*

Observations on 24 Italian ecotypes and a number of introductions from other countries were made in a wide range of localities in Italy, Sicily and Sardinia. In the first year of growth in trials at Lonigo in northern Italy, the local ecotype, referred to as Leonicena, yielded less than ecotypes from most other parts of Italy. In the second year Leonicena was superior to many of the others and the average for the two first years was roughly equal to that of the others. In the third, fourth and fifth years Leonicena exceeded most other Italian ecotypes and its average yield over the period was also higher. The deterioration of the local lucernes in many parts of Italy in recent years is thought to be due to their loss of purity, brought about by the introduction of foreign strains which are inferior in persistency, though they may be more productive in the first year or so.

When the introductions were also taken into account, the highest yields in the first and second years were given by Flamande Vilmorin and the lowest by Ranger, which however moved to fourth place in the third year and first in the fourth, when Flamande Vilmorin had almost ceased growing altogether. The highest average yield over the four years was still however given by Leonicena. Thus early-producing varieties of the Flamande Vilmorin type can be recommended only for intensive conditions where they can be resown after two years. All types started flowering later than Leonicena, with a consequent delay of the first cut; Flamande Vilmorin was 5 days later and Ranger 20 days; Leonicena also recovered more quickly after cutting, particularly in dry years and was shorter when flowering began; this permitted six cuts a year to be made from Leonicena at Lonigo whereas Ranger, which also stops growing at an earlier date, gave only four cuts; though the yield from individual cuts was greater in Ranger, this did not outweigh the decreased total yield resulting from the lower number of cuts.

The view is expressed that genotypical differences between lucernes are more evident in the first year of growth and become more and more overshadowed by environmental effects in the second and succeeding years; this overshadowing sets in somewhat later in cultivars, which are genotypically pure, than in ecotypes, which are mixed populations. On careful examination the ecotype Leonicena could be separated into four main types differing somewhat in habit, lignification, size, number and form of leaves and flower colour; full details are given of plants representing each of the four types. The proportion of the erect type, with small, dark-green leaves and dark flowers, increased from year to year and this type is evidently the best adapted to conditions at Lonigo. Thus seed taken from a population in the fifth year would be expected to contain a greater proportion of this type than seed taken in the early years of growth; actual observations showed that the difference, though detectable, is less pronounced than anticipated owing to the subtypes present in lower proportions having produced a larger yield of seeds.

It is suggested that the best way to improve lucerne by breeding is to produce synthetic populations from the best of the subtypes constituting the local races, rather than to aim at a cultivar which is genotypically homogeneous. Increased longevity should be aimed at both by selection and by appropriate methods of cultivation. Collections have been made of good typical plants of the Leonicena ecotype in natural populations and some 2000 plants have been studied during four successive years; less promising plants were discarded and at the end of the four years 550 plants remained; seed from interpollination of these plants has given rise to lucerne populations showing marked superiority to the original ecotype.

Recommendations are given as to the best methods of growing lucerne, particularly for seed production.

4318 *Landi, R. Risultanze di prove collegiali di confronto tra mediche di diverse provenienze. (Results of cooperative comparative trials of lucernes of different provenance). (pp. 160–82).*

In trials of lucerne ecotypes in different localities of Italy the local ecotype of the respective locality almost invariably gave higher yields than those from other parts of Italy or from elsewhere. In any one locality ecotypes of more northerly provenance gave better results than those from further south. In three-year leys, which is the system of cultivation recommended, ecotypes from the USA, particularly Ranger, were clearly inferior to the Italian ecotypes. Under expecially favourable conditions the French types could equal the local, particularly Flamande Vilmorin in the north and du Poitou in the more southerly areas, and in one locality, Quarto, they excelled the local ecotype in yield.

Certain strains, including Maliani's selection, proved to have a lower proportion of dry matter to green matter than the rest and are considered to be superior in quality. Several Italian selections, such as Maliani's selection and Bresaola's 21, 151 and 202, recovered more quickly after cutting than other types, the slowest in this respect being Ranger.

4319 *Girotto, G. Cenni sulla coltura della medica in Maremma e sue possibilità di miglioramento. (Notes on the cultivation of lucerne in the Maremma and the possibilities of improving it). (pp. 227–34).*

The results of trials of 11 ecotypes in the region of Castiglione are presented in tabular form. The highest yields of green matter and of hay were given by the French lucernes Provence and du Marais. The local and Sabina ecotypes also gave good yields.

4320 *Discussione generale. (Discussion). (pp. 235–47).*

During a discussion in which several speakers urged the desirability of colouring imported seed, A. Grimaldi expressed the view that imported ecotypes, if they were ill-adapted climatically, would produce less seed and natural selection would therefore operate against them.

4321 Gross, H. D., Wilsie, C. P. & Pesek, J. **Some responses of alfalfa varieties to fertilization and cutting treatments.**
Agron. J. 1958 : **50** : 161–64.

A study was made of the response, in terms of forage yield and stand, of the following lucerne varieties to four fertilizer treatments (none, P, K, PK) under two cutting systems at Ames, Ia.: the synthetic A–224, Atlantic, Buffalo, Grimm, Ladak, Narragansett, Ranger and Vernal. For the two-year period 1954–55 the interactions variety x P, variety x cutting treatment and variety x cutting treatment x P were significant for yield. In the third year, when the plots were harvested similarly, the interactions variety x P and previous cutting treatment x K were significant. Several varieties displayed flexibility in response to management practices, as indicated by yield. Differences in stand due to variety and cutting and fertilizer treatments were not reflected in yield.

4322 Heinrichs, D. H. & Bolton, J. L.
Rambler alfalfa.
Publ. Canad. Dep. Agric. 1958 : No. 1030 : Pp. 15.

A detailed account is given of the above creeping-rooted synthetic variety with respect to its parentage, characteristics, dry-matter yield, seed yield and winter hardiness in extensive tests in Canada [XXVI, 467 and XXVIII, 4323]. Rambler is well adapted for forage production under unirrigated conditions in Alberta, Saskatchewan and Manitoba.

4323 Heinrichs, D. H.
"Rambler" alfalfa story.
Agric. Inst. Rev. 1958 : **13** : 15–17.

An account is given of the above lucerne variety, with respect to its origin, productivity, winter hardiness, creeping-rooted character, role in Canadian agriculture and seed production [cf. XXVI, 467].

4324 Wilsie, C. P.
Effect of inbreeding on fertility and vigor of alfalfa.
Agron. J. 1958 : **50** : 182–85.

Self fertility of 437 plants chosen from F_1 progenies of single and three-way crosses averaged 0·75 seeds per flower tripped under greenhouse conditions at the Iowa Agricultural Experiment Station.

In general, loss of self fertility as the result of one generation of selfing has averaged 80–90%. The average loss in vegetative vigour in terms of forage yield has been 20–30% as the result of one generation of selfing. In an experiment on eight clones, loss in vigour was greater from the S_1 to S_2 than from the S_0 to S_1. Reasons are given for the view that estimation of inbreeding depression should be carried out on the basis of the repetitively propagated clone rather than by determining the yield ratio of selfed and open-pollinated progenies or studying the polycross performance of the inbred material.

4325 van Ooststroom, S. J. & Reichgelt, Th. J.
Het gesiacht *Medicago* in Nederland en België. (**The genus *Medicago* in the Netherlands and Belgium**).
Acta. bot. neerl. 1958 : **7** : 90–123.

Taxonomic descriptions of the 22 species occurring in the Netherlands and Belgium are given together with notes on their origin and distribution and illustrations of fruit characters. *M. sativa* is regarded as comprising the three subspecies *sativa, falcata* and *varia.*

4326 Smith, D.
Performance of Narragansett and Vernal alfalfa from seed produced at diverse latitudes.
Agron. J. 1958 : **50** : 226–29.

As shown by investigations at Madison, Wis., natural selection resulted in marked changes during one generation of seed increase in a latitude widely separated from the latitudes where the varieties were originally multiplied. Populations from seed increased in a region considerably further south (Mexico) suffered more winter injury and showed a tendency to contain a larger number of taller plants after cutting in early autumn. A reverse trend was detected in populations derived from seed increased much further north (Alaska or Canada). The changes were more pronounced in the case of the seed produced in Mexico. Type of plant growth and winter survival were closely associated. The short, spreading type underwent the least winter injury.

4327 Seth, J. & Dexter, S. T.
Root anatomy and growth habit of some alfalfa varieties in relation to wilt resistance and winter-hardiness.
Agron. J. 1958 : **50** : 141–44.

Short days in the greenhouse caused a marked reduction in top growth in winter-hardy varieties. Exposed to long days, most of these varieties showed a considerable amount of top growth. The reaction of nonhardy varieties to day length was less pronounced. Photoperiod had little effect on root growth in either hardy or nonhardy varieties. In both the field and greenhouse, hardy varieties formed large and small xylem vessels respectively during long and short days. Nonhardy varieties did not exhibit a marked contrast in this respect. Varieties susceptible and resistant to bacterial wilt were similar in root anatomy.

4328 Paradiev, A. & Artomasov, V.
(The seed production of lucerne on the state farm "Pahta-Aral").
Hlopkovodstvo (Cott.-raising) 1958 : No. 4 : 34–36. [Russian].

Mention is made of two new lucerne varieties bred at the Cotton Institute. S139 is more productive and less liable to lodge than Fergana 700 which it is superseding. The other variety, 15–05, is at an advanced trial stage.

329 SCHMIEDEKNECHT, M.
Untersuchungen zur Spezialisierung von *Pseudopeziza medicaginis* (Lib.) Sacc. [**Investigations on the specialization of *P. medicaginis* (Lib.) Sacc.**].
Phytopath. Z. 1958 : **32** : 433–52.

After defining the species *Ps. medicaginis*, it is hown that clear morphological and physio-ogical differences exist between strains from *Medicago sativa*, *M. varia* and *M. falcata*, on the ne hand, and *M. lupulina* on the other; *Ps. medicaginis* is now subdivided into two formae peciales. Twenty species and subspecies of *Medicago* and 38 cultivated strains of lucerne f various provenance were tested with the athogen and differences were found between he species in respect of their reaction to the two orms of the pathogen. It is thought that it would be possible to breed an interspecific hybrid resistant to *Ps. medicaginis*.

A procedure is described for infecting the plants o be tested; seedlings are grown in a glass ontainer roofed over by a mesh carrying nfected material from which spores fall on to he seedlings underneath.

330 PADILLA A., R. & YOUNG, W. R.
El pulgón manchado de la alfalfa en México. *Therioaphis* (*Pterocallidium*) *maculata* (Buckton).
[**The spotted alfalfa aphid in Mexico. *Therioaphis* (*Pterocallidium*) *maculata* (Buckton)**].
Foll. téc. Secretaría Agric. Ganad., Méx. 1958 : No. 25 : Pp. 32.

In the course of this paper on the biology and ontrol of the above pest it is noted that breeding or resistance has begun in Mexico. So far, in ests of the best lucerne varieties adapted to the Bajío and the Valley of Mexico, resistant ndividuals have been found to occur at a requency of only about one plant per 3000.

331 HACKEROTT, H. L., HARVEY, T. L., SORENSEN, E. L. & PAINTER, R. H.
Varietal differences in survival of alfalfa seedlings infested with spotted alfalfa aphids.
Agron. J. 1958 : **50** : 139–41.

Thirty-one varieties exhibited wide differences n percentage of survival after infestation with he spotted alfalfa aphid (*Therioaphis maculata*) n the greenhouse at an average temperature of 5° F. In general, varieties of Turkistan parent-ge showed the best survival. Polycross pro-enies of plants surviving infestation, selected rom eight varieties ranging in survival per-entage from 23 to 2%, surpassed the parental varieties in survival to a very considerable extent. The results of the greenhouse tests showed good correspondence with those from evaluation by natural infestation in the field.

4332 Stammeforsøg med Rødkløver 1953–57. (**Strain trials of red clover, 1953–57**).
Tidsskr. Frøavl 1958 : **23** : 370–72.

Details of yields of dry matter and protein are presented for seven varieties tested on different soil types at ten stations in Denmark.

4333 BUDA, L., OBREJANU, GR., RESMERIȚĂ, I. & VELEA, C.
Contribuţii la ameliorarea trifoiului roşu de Transilvania. (**Contributions to the improvement of Transylvanian red clover**).
Stud. Cercet. Agron., Cluj 1957 : **8** : 139–46.

By mass and individual selection of local populations, marked improvements in green matter and hay production have been effected. Tables showing the performance of seven improved varieties during 1952–6 are presented.

4334 SEAY, W. A. & HENSON, L.
Variability in nutrient uptake and yield of clonally propagated Kenland red clover.
Agron. J. 1958 : **50** : 165–68.

Highly significant differences in dry-matter yield and uptake of P and K were found between clones of Kenland. Variation in these respects among six replications of the same clones was negligible. If these properties are to be evaluated in breeding, it would be necessary to measure them for only 3 or 4 cuttings.

4335 **New red clover variety.**
Sth. Seedsman 1958 : **21** : No. **3** : p. 38.

The variety Chesapeake is the result of 30 years natural selection on a farm in Talbot County, Maryland, and is distinguished by its good seedling vigour and persistence. It is moderately resistant to *Colletotrichum trifolii* and is widely adapted, giving high yields in Maryland, Wisconsin, Kentucky, Massachusetts and Virginia.

4336 BINGEFORS, S.
Svalöfs Ulva tetraploid rödklöver. Erfarenheter från försök och odling i Mellansverige. (**The Svalöf tetraploid red clover Ulva. Experiences from trials and cultivation in central Sweden**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 7–32.

This new red clover, developed by the Swedish Seed Association by chromosome doubling of the local variety Ultuna followed by selection for resistance to *Ditylenchus dipsaci*, has exceeded Ultuna and equalled Merkur in green-matter yield in first-year leys and has given yields equal to or higher than those of the first year in second-year leys. Ulva appears also to have improved resistance to *Sclerotinia trifoliorum* in common with other tetraploid varieties. Its dry-matter content is slightly lower than that of Ultuna, but the proportion of protein in the dry matter is higher. The chief disadvantage of the variety is its low seed set, resulting from the inability of bees other than certain bumble bees to effect pollination.

4337 Wexelsen, H. & Mikaelsen, K.
The effect of neutron treatment of seeds on seedlings of diploid and tetraploid red clover (*Trifolium pratense*).
Physiol. Plant. 1958 : **11** : 374–81.

The effects of neutron treatment with respect to percentage and rate of germination, chlorosis, leaf deformation and seedling vigour and weight were determined. None of the tetraploid strains represented a double form of any of the diploids tested. The tetraploids were more resistant to damage causing temporary chlorosis and leaf deformation and suffered less reduction in weight than the diploids.

4338 Palamarčuk, A. S. & Karpovič, N. F.
(Variability in crude protein of clover leaves, depending on population, age and environment).
Fiz. Rasten (Phys. Pl.) 1958 : **5** : 83–85. [Russian].

Analyses at L'vov of *Trifolium pratense* populations from the Poles'e showed that they were better adapted to peat soils than mineral soils and had a higher crude protein content on the former. Differences between populations in protein yields were noted. Most were richer in protein in the second year than the first but some had a high protein content in the first year and about the same or lower in the second year.

4339 Frandsen, K. J.
Om Rødkløverstammernes Resistens mod Kløveraal og Bægersvamp. **(On the resistance of red clover strains to eelworm and root rot).**
Tidsskr. Frøavl 1958 : **23** : 390–96.

Among semilate varieties showing resistance to eelworm in inoculation and field tests at Øtoftegaard and other stations in Denmark are Halvsildig Øtofte Resistent III [Semilate Øtofte Resistant III], Halvsildig Øtofte Resident IV, Merkur, Øtofte IV and some new Øtofte élites. The early varieties Tidlig Øtofte Resistent III [Early Øtofte Resistant III], Hjelm [Helmet] and a new early élite were also resistant. Halvsildig Øtofte Resistent III and Øtofte Resident IV were resistant to root rot.

4340 Stammeforsøg med Hvidkløver 1950–1957. **(Strain trials of white clover, 1950–1957).**
Tidsskr. Frøavl 1958 : **23** : 373–75.

Information is presented on the yields of dry matter and crude protein of 13 varieties tested on different soil types at six stations in Denmark. Pajbjerg Milka gave the highest yields.

4341 Daday, H.
Gene frequencies in wild populations of *Trifolium repens* L. III. World distribution.
Heredity 1958 : **12** : 169–84.

The distributions of the frequencies of *Ac* for lotaustralin (+ linamarin) production and of *Li* for presence of linamarase were determined [cf. XXIV, 3082 and XXV, 2102]. In Europe and the mainland of Asia, clines ranging in frequency from 100 to 0% occur in the case of each gene, decrease in frequency being closely associated with decrease in January mean temperature. The Japanese samples could be divided into those with mixed gene frequencies from the southern region where the winter is warm and those with decreasing frequencies of *Ac* from the northern area. Evidence of a cline for frequency of *Ac* in North America was obtained but the relationship between frequency and January mean temperature is not significant. In South America, South Africa, Australia and New Zealand, the frequencies of both *Ac* and *Li* exhibit an irregular pattern. Natural selection has therefore produced a balanced equilibrium between gene frequencies and January mean temperature in Europe and the mainland of Asia but such an equilibrium has not yet been reached in N. America or Japan. With the exception of mountainous regions, clines for *Ac* and *Li* frequencies are not expected in the southern hemisphere, where the range of winter temperature required as a selective force does not occur.

In addition, a correlation between frequency of *Ac* and lotaustralin content was established.

4342 Kazimierski, T.
Transformation of ovary into leaves in tetraploid white clover (*Trifolium repens* L.) and in Swedish clover (*Trifolium hybridum* L.).
Bull. Acad. polon. Sci. : Sér. Sci. Biol. 1958 : **6** : 103–08.

Varying degrees of floral abnormality, the mos extreme forms showing leaves in the position of the ovaries, were found among tetraploid populations of the above two species at Poznań in 1957. Abnormalities were not observed in 1956 and it is thought the extreme dryness of the climate in 1957 may have been of importance in inducing the teratological conditions. Diploid plants were all normal.

4343 Laude, H. M., Stanford, E. H. & Enloe, J. A.
Photoperiod, temperature, and competitive ability as factors affecting the seed production of selected clones of Ladino clover.
Agron. J. 1958 : **50** : 223–25.

All the 21 clones from which the variety Pilgrim was developed showed a long-day response, greater variability in reaction to photoperiod being found in shorter days. Under field conditions at Davis, Calif., variation among the clones in the average time at which the first petal appeared in the earliest head on the plant ranged from 8 to 10 weeks. Duration of the flowering period varied from a few days to 14 weeks. The proportion of the seed contributed by the different clones may therefore depend on date of harvest. Earliness of flowering was positively correlated with greater total flowering during the season. Vegetative growth was not necessarily related to amount of flowering. Overwintering in the field hastened flowering and increased the number of heads produced in all clones, apparently as the result of a response to lower temperature rather than better establishment. The clones differed considerably in vegetative vigour; the seed may therefore be derived chiefly from the stronger competitors. The significance of these results in the production of synthetics is discussed.

4344 Yamada, T.
(Studies on the drought resistance of Ladino clover. I. Differences in the drought resistance of 4*x* and 8*x* plants in pot culture and its mechanism. II. Differences in drought resistance between types grown in large concrete tubs).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1958 : **26** : 219–23. [Japanese].

The material studied comprised 4*x* and 8*x* strains of types with (1) abundant or (2) sparse foliage. Chromosome number had little effect on drought resistance. In the pot cultures, wilting due to drought was correlated with number of leaves. In the tubs, however, the type with numerous leaves withstood drought better, probably because of superior root development.

4345 Davern, C. I.
The genetic and physiological basis of flowering in subterranean clover (*Trifolium subterraneum* L.).
J. Aust. Inst. agric. Sci. 1958 : **24** : 59–60.
[Cf. XXVII, 4117].

4346 Carpenter, J. A.
The induction of mutation in subterranean clover by X-irradiation.
J. Aust. Inst. agric. Sci. 1958 : **24** : 39–44.

A number of mutant forms were observed in the X_1 and X_2 progeny grown from X-irradiated seed. Of the X_2 mutants 28% were dwarf or small plants and 42% were chlorophyll mutants. Complete fertility was shown by 31% while 41% were classed as semilethal or semisterile and 28% as fully lethal or sterile. Storage of irradiated seed for two years had a small deleterious effect on X_1 survival.

4347 Rudorf, W. & Schwarze, R.
Beiträge zur Züchtung eines cumarinfreien Steinklees und Untersuchungen über Cumarin und verwandte Verbindungen. (**Contribution to the breeding of coumarin-free sweet clover and investigations on coumarin and related compounds.**)
Z. Pflanzenz. 1958 : **39** : 245–74.

Plants almost free of coumarin were selected from populations originating from the cross (*Melilotus alba* x *M. dentata*) x *M. alba*; these hybrids had been bred by Smith at Madison, Wis. [cf. XVIII, 2294]. One of the coumarin-free races was crossed with two bushy forms of *M. alba* and the coumarin content was determined in F_2 and F_3 progeny. From these results, it was concluded that the absence of coumarin is inherited as a recessive factor. Of six F_2 plants, four were found to be homozygous for the absence of coumarin and the other two segregated in a ratio of 3 : 1 for low coumarin and absence of coumarin respectively; the low coumarin content corresponded to $\frac{1}{10}$ of that of bitter Hubamklee [Hubam Clover] and coumarin-free plants had less than $\frac{1}{100}$ of the coumarin content of Hubamklee. It was suggested that a high coumarin content is determined by a dominant allele *Cu*, a low coumarin content by a second allele *cu*, and a third designated cu_2 is responsible for the absence of coumarin. However further experiments are necessary to determine whether or not this hypothesis is correct. One of the coumarin-free forms obtained in the above experiments has been given the name Acumar.

By means of a technique involving paper electrophoresis of an alcoholic extract of leaves, coumaric acid was separated from other fluorescent substances which hinder the estimations of coumarin content based on the intensity of fluorescence in UV radiation. Bound coumarin was also separated by paper chromatography and suggestions made as to its nature. Procedures for the quantitative estimation of coumarin are described, coumarin being extracted by ether and measured in a photometer; when estimating free coumarin only, the tissue glycosidase is inactivated by sulphuric acid, before the coumarin is extracted. Simple processes for detecting coumarin in leaves were also developed. In one case, leaves are pressed with a glass rod on filter paper so that a little sap comes out and then a drop of caustic soda is added. Alternatively leaves are placed in small glass containers with alcohol before the caustic soda is added. In both cases, a yellowish green fluorescence indicated the presence of coumarin. A direct relation between the intensity of fluorescence and coumarin concentration was only found for very low concentrations.

4348 Scheibe, A. & Hülsmann, G.
Mutationsauslösung durch Chemikalien beim Steinklee (*Melilotus albus*). [**Production of mutation by means of chemicals in sweet clover (*M. albus*)**].
Z. Pflanzenz. 1958 : **39** : 299–324.

Plants of a uniform line of *M. alba* were treated with solutions of various molar concentrations of ethyl urethane in combination with potassium chloride, aluminium chloride, aluminium nitrate, glycol and glycol together with potassium chloride. Oehlkers' method of application was used and the solutions were found to spread in all directions from the point of application on the plant; all the substances had some toxic effects and at the higher concentrations these were soon shown by discoloration of the tissues. Seed set after selfing was lower in treated plants than in untreated and the germinating capacity of seeds was also reduced, when the seed was stored for 1½ years after ripening. The C_1 seedlings showed various morphological and physiological defects and aberrant types were also found among the C_2 generation; these included dwarf forms, others with forked inflorescences and a *prostrata* type. *Chlorina*, *xantha* and *maculata* types occurred quite frequently and unlike those of the C_1 generation, the defects remained until the end of the vegetative period. Specific relations between the mutagenic agents and types of mutation were not found, although morphological abnormalities were particularly frequent after treatment with $AlCl_3$.

Of most interest from the point of view of breeding were twelve C_2 plants with a particularly low content in the fresh leaves of bitter substances (coumarin and allied compounds); seven of these plants came from a parent treated with $\frac{1}{1000}$ M $AlCl_3$. After drying in air, the bitter content in the leaves of three plants remained at a level between 0·009% and 0·075%. It is thought that studying these types may throw light on the biosynthesis of coumarin.

4349 **Cumino—sweet clover.**
Seed Scoop 1958 : **4** : No. **3** : p. 6.

In appearance and performance this new variety is similar to Arctic but is free from coumarin. It was developed at the Forage Crops Laboratory, Saskatoon, Sask., Canada, from a coumarin-deficient line from Wisconsin crossed with Arctic and Pioneer.

4350 **New variety of clover offered.**
Canad. Grain J. 1958 : **14** : No. **4** : p. 24.

Cumino, a coumarin-free variety of sweet clover, has been released by the Manitoba Department of Agriculture.

4351 Gorz, H. J. & Haskins, F. A.
Rapid tests for free and bound coumarin in sweet clover.
Agron J. 1958 : **50** : 211–14.

[Cf. 1317].

4352 Baenziger, H. & Greenshields, J. E. R.
The effect of interspecific hybridization on certain genetic ratios in sweet clover.
Canad. J. Bot. 1958 : **36** : 411–20.

Crosses were made involving, on the one hand, three derivatives of the cross (*Melilotus alba* x *M. dentata*) x *M. alba*, N, D and D_2, and on the other hand the varieties Arctic (A) and Pioneer (P). In the F_2 generation of the crosses D x A and D_2 x A, marked deficiencies were found in low-coumarin classes. Selection had occurred against *cu cu* genotypes and this was also found to a lesser degree in progenies from crosses of the N plant. The D parent was homozygous for a dwarf growth habit, designated α, and in the F_2 of the cross D x A a ratio of approximately seven normal types to one α was given, the deficiency of α types being similar to that of low coumarin segregates. Crosses were also made between permeable-seeded strains of

M. alba and coumarin-deficient F_3 segregates of a *M. officinalis* x *M. alba* cross; no coumarin-deficient permeable-seeded plants were obtained in the F_2 progeny. Since these results could not be explained by linkage, the two recessive genes for these characters must have been either lethal or rendered fertilization unsuccessful when in combination. Four of the 11 F_2 families show deficiencies in permeable-seeded types and all families had less than the expected number of homozygous low-coumarin types. In all the crosses studied, deficiencies were found in those genotypic classes which contained genes contributed by offspring of interspecific crosses. Irregular segregation therefore appears to be associated with interspecific hybridization.

4353 SANDAL, P. C.
Interspecific hybridization between yellow (*M. officinalis*) and white (*M. alba*) sweet-clover using embryo culture.
Proc. N. Dak. Acad. Sci. 1956 : **10** : p. 37.

Whereas low-coumarin lines of white sweet clover are available, so far selection for low-coumarin lines of yellow sweet clover has met with no success. Crosses between these two types are possible but the developing embryos usually abort when 2 to 3 weeks old. In the experiments mentioned, about 24,000 flowers were crossed, the female parents being a series of yellow sweet clovers and the male parents white. Of the 900 two-week old embryos transferred to an agar medium containing plant nutrients and sugar, one third made some growth and a number of seedlings were raised. Further attempts to produce low-coumarin yellow clover are under way.

4354 CONNIN, R. V., GORZ, H. J. & GARDNER, C. O.
Greenhouse technique for evaluating sweetclover weevils' preference for seedling sweetclover plants.
J. econ. Ent. 1958 : **51** : 190–93.

Different experimental designs for testing for resistance to sweet-clover weevil (*Sitona cylindricollis*) were investigated at the Nebraska Agricultural Experiment Station. The most reliable results were obtained when five varieties per flat were replicated in two 5 x 5 Latin squares infested at the rate of two weevils per seedling. For routine testing one of the five varieties in each flat should be a control. C–659, a selection homozygous for susceptibility, is to be used as a standard control in future tests. To overcome the limitation of evaluating only four varieties per flat, the best selections from different flats are to be retested and compared in the same flat. The plants should be infested at the stage of the first trifoliate leaf and the weevils removed when the first of the control plants is completely defoliated. Readings should then be made within one day.

4355 ATABEKOVA, A. I.
(The phenomenon of heterosis in leguminous plants).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **112** : 951–53. [Russian].

Most species and forms of lupin studied at the Timirjazev Agricultural Academy showed inbreeding depression on selfing for one or more generations. *Lupinus angustifolius* was among the few forms where self pollination had no harmful effects. By inbreeding *L. mutabilis*, *L. ornatus*, *L. hybridus*, *L. hartwegii*, *L. nanus* and also *Phaseolus multiflorus* for 4–6 generations, material uniform morphologically and physiologically and with half the normal yield was obtained. However, after pollination of the inbreds by the respective initial forms, heterotic effects were produced. These could be observed as early as the seed stage, since the cotyledons became so large that they broke the testa. The stomata of the heterotic plants were twice the usual size.

4356 JARANOWSKI, J.
Investigations on generative hybridization of white lupine (*L. albus*) and yellow lupine (*L. luteus*) with the aid of vegetative grafts.
Bull. Acad. polon. Sci. : Sér. Sci. Biol. : 1958 : **6** : 139–144.

Morphological studies and analyses of alkaloid content of reciprocal grafts between white and yellow lupins failed to provide any evidence of vegetative hybridization in the scions, in their seed progeny, or in grafts of the latter. Sexual interspecific crosses between grafted plants were as unsuccessful as those between ungrafted individuals.

4357 TROLL, H.-J.
Probleme der Erntesicherung der gelben Süsslupine nach 25 jährigem praktischem Anbau. (**Problems of making sure of the yield of the yellow sweet lupin after 25 years of practical cultivation**).
Dtsch. Landw., Berl. 1958 : **9** : 118–21.

A survey is presented of the improvement obtained in the sweet yellow lupin during the 25 years since Sengbusch bred his first variety of agronomic value; further necessary improvements are mentioned. Some of the best known varieties in current use are listed together with their principal characteristics.

4358 FISCHER, H. E.
Die Wirking von Spindelgiften auf *Lupinus luteus* L. (**The action of spindle inhibitors on *L. luteus* L.**).
Genetica 1958 : **29** : 155–71.

Observations were made on stathmocinesis in radicles of *L. luteus*; the spindle inhibitors used were the hydrophilic substances colchicine and aurantia (hexanitrodiphenylamine-Na) and the lyophilic substances ACE (acenaphthene) and HCH (γ-hexachlorocyclohexane). Treatment with the hydrophilic substances resulted chiefly in the formation of a rounded mass of chromatic material. Application of ACE produced clusters of chromosomes, some of which became clumped together. HCH also caused much clumping together of the chromosomes and in some cases the formation of clusters or groups of agglomerated chromosomes. These substances had clearly distinguishable effects only at high concentrations.

4359 VED PAL SINGH
Studies in the artificial germination of pollen grains : 1. Germination of pollen grains of *Sesbania aculeata* Pers. and *Crotalaria juncea* Linn.
Agra Univ. J. Res. 1957 : **6** : 63–68.

An agar medium with 12% sucrose proved to be the best for culturing pollen of *S. aculeata*. Application of this medium to the stigmas of *C. juncea* may therefore prove helpful in crossing the two species. In *C. juncea* the pollen had the highest germination percentage with 14% sucrose while the length of the tubes was greatest with 10% sucrose.

4360 BARCLAY, P. C.
Improvement of *Lotus uliginosus*.
Proc. NZ Grassl. Ass. 1957 : **19** : 75–81.

An improved diploid strain has been developed at the Grasslands Division, Palmerston North, from adapted material in New Zealand and is now undergoing extensive trial. It has outyielded commercial varieties in both spaced plantings and plots, and withstood competition from volunteer white clover during the period when the trefoil is dormant. F_1 hybrids between New Zealand *L. uliginosus* and a Portuguese introduction exhibit the winter growth of the latter parent but are inferior to adapted varieties in summer growth. The hybrids are therefore being back-crossed to New Zealand varieties in the hope of securing a favourable balance between winter and summer growth. Colchicine-induced tetraploids have larger seeds and consequently greater seedling vigour than diploids but show a reduction of about 50% in number of seeds set per pod. The tetraploids and diploids do not however differ significantly in number of pods per head. An attempt is being made to improve seed setting in the tetraploids by selection. Tetraploidy has also been induced in the Portuguese introduction with a view to incorporating capacity for winter growth in the tetraploids of the local trefoil.

4361 LARSEN, K.
Cytotaxonomical studies in *Lotus* IV. Some cases of polyploidy.
Bot. Tidsskr. 1958 : **54** : 44–56.

In the present paper of this series [cf. XXVII, 639], the following somatic chromosome numbers are reported: *L. villosus*, 14 and 28, the tetraploid material studied being morphologically distinct from the diploid; *L. creticus* var. *cytisoides*, 14; *L. commutatus* var. *commutatus*, 28; *L. judaicus*, 14; and *L. corniculatus* var. *heterophyllarius*, 12. It is suggested that the last mentioned variety may be identical with *L. frondosus*.

4362 HEAD, S. C.
Mitotic chromosome studies in the genus *Astragalus*.
Madroño, S. Francisco 1957 : **14** : 95–106.

Chromosome counts and drawings were made of 26 American species representing 13 sections of the genus. The $2n$ numbers 16, 22, 24, 26 and 28 were found.

ROOTS AND TUBERS

4363 MAGASSY, L.
Reciprok rekurrens szelekció alkalmazása a répanemesítésben. (**The use of reciprocal recurrent selection in beet breeding**).
Növénytermelés 1957 : **6** : 357–66.

Methods of reciprocal recurrent selection are surveyed and a new method described. The latter involves (1) the hybridization within a simple polycross block of individuals of two varieties selected on the basis of their performance in test crosses, (2) sexual propagation of clones of those individuals which on the basis of progeny tests show the best combining ability and (3) crossing to produce commercial hybrid seed or to give lines serving as starting material for the next cycle of selection. This method is regarded as being more reliable for selection of good reciprocal combining material than methods not employing the polycross block.

4364 Wenzl, H. & Krexner, R.
Über Hohlraumbildung in *Beta*-Wurzeln. (**On the formation of cavities in *Beta* roots**).
PflSchBer. 1958 : **20** : 179–97.

Studies at Fuchsenbigl, Austria, indicated that varieties of *Beta* differ in their tendency to form internal cavities in the roots; further investigations of this question are considered necessary.

4365 Willey, L. A.
Mangel and fodder beet trials, 1947–1950.
J. nat. Inst. agric. Bot. 1957 : **8** : 106–15.

Trials were conducted at several centres in England to compare Danish varieties of sugar beet for fodder and of mangel with English mangels. Barres Øtofte IX and X combined desirable field characters with superior dry-matter yield and keeping quality, suggesting that this type may be suitable as a substitute for English mangels.

4366 Knight, R. L.
Fodder beet and high dry-matter mangel trials 1952–1954.
J. nat. Inst. agric. Bot. 1957 : **8** : 116–34.

Grown in three separate series at centres chiefly in England, the trials comprised (1) Hunsballe X (control), Brabant Half Sugar, Hinderupgaard X, Pajbjerg Rex X, Pajbjerg X and Klein E sugar beet, (2) Red Øtofte X (control), Triumf, White Tystofte X, Yellow Øtofte X and Yellow Dæno XI, and (3) Barres Øtofte X (control), Barres CB, Øtofte Nova X, Regia and White Chief. For each series full details of root numbers and yields of dry matter and tops are given, with mean results for yields of clean roots, dirt tares, dry-matter content, bolters and field characters such as ease of lifting, depth of root in soil, fanging and keeping quality in the clamp.

4367 Csapody, Gy. (Mrs.)
A répa vegetatív szaporítása a heterozis nemesítés szolgálatában. (**Vegetative propagation of beet in the service of heterosis breeding**).
Növénytermelés 1957 : **6** : 109–18.

The methods of vegetative propagation employed at the Sopronharpács Institute of Plant Breeding and Crop Production, Hungary, in breeding hybrid beets are described.

4368 Stoppelknollen, 1958. (**Turnips, 1958**).
Landbouwvoorlichting 1958 : **15** : Bijl. 30; Ber. Rassenkeuze No. 247. Pp. 6.

Tabulated data on content and yield of dry matter are given for 31 varieties tested in the Netherlands in 1954–57, together with descriptive notes on each variety.

4369 Opsahl, B.
Forsøk med stammer av kålrot. (**Trials of swede strains 1953–1956**).
Forskn. Fors. Landbr. 1958 : **9** : 1–16.

Data are given on the performance and quality of 16 varieties tested at nine localities in Norway, information on resistance to club root being included.

4370 Josefsson, A.
Svalöfs Fenixbangholm stam 035—en ny kålrot. (**Svalöf Fenixbangholm strain 035, a new swede**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 52–60.

Developed from a cross between Bangholm 05 and Bangholm 026, the strain is to be released in spring 1958. It exceeds Bangholm 05, which it is to replace, by about 19% in dry matter yield, although differing little in dry matter content. It also outyields other Bangholm strains and some other varieties. It is short necked with nearly spherical roots.

4371 Heyland-Steinhilber, H.
Untersuchungen über ein in Württemberg an Kohlrüben (*Brassica napus rapifera*) vorkommendes Virus. [**Investigations on a virus occurring in Württemberg on swedes (*B. napus rapifera*)**].
Phytopath. Z. 1958 : **32** : 181–206.

The virus studied was first noticed in 1939 on swedes in Württemberg; it is thought to belong to group 1 of the turnip virus. The reaction of a series of swede varieties to this virus was observed at St. Johann and Hohenheim; Borries Vogesa was the most resistant. A negative correlation appeared to exist between yield and susceptibility to the virus.

4372 Wilson, A. R.
The origin and aims of the European Association for Potato Research.
Europ. Potato J. 1958 : **1** : 1–4.

Information is provided on the informal conferences which preceded the formation of the above association at a fourth international conference on potatoes held at Lund, Sweden, in 1957. The association is concerned with promoting international cooperation in research on a wide range of problems, including breeding.

4373 **Results of potato variety trials.**
Leafl. Minist. Agric. N. Ire. 1958 : No. 7 : Pp. 17.

A summary is given of trials on standard varieties, recently introduced new varieties and promising seedlings.

Seedlings 234/50 and 480/51, developed by the Northern Ireland Ministry of Agriculture, have been approved for registration. Seedling 234/50, a first-early, is similar to Arran Pilot in cooking quality and many other respects but considerably more resistant to late blight. It has been a consistently heavy cropper. Seedling 480/51, an early maincrop variety, produces white oval tubers with pink colouring rather similar to that of King Edward VII. In addition to being blight resistant, it is field resistant to viruses X and A. In yield it appears to be equal or slightly superior to King Edward. Its tendency to have a shorter period of dormancy than King Edward may be an advantage where early crops are required.

Ulster Ranger and Ulster Glen, two early maincrop varieties recently introduced by J. Clarke, are considered promising. Both produce white-skinned, oval tubers with shallow eyes and flesh colour resembling that of King Edward. In cooking quality, Ulster Ranger is good and Ulster Glen moderately good. Both have shown a high degree of field resistance to late blight. The recently-introduced yellow-fleshed varieties Ulster Malta and Clarke 961, both for the early maincrop, have given encouraging results. It is hoped that these and other new yellow-fleshed varieties will be suitable for exporting as seed to Mediterranean countries.

4374 Schick, R.
Methoden und Probleme der Kartoffelzüchtung. (**Methods and problems of potato breeding**).
SB dtsch. Akad. LandwWiss. Berl. 1956 : **5** : No. 29 : 1–40.

In discussing the selection of suitable parents for breeding and the importance of heterosis, reference is made to Möller's work on producing early varieties [cf. XXVII, 1925], breeding at Gross-Lüsewitz for resistance to degeneration and Engel's study of heterosis effects resulting from crossing related inbreds [cf. XXVII, 4139]. Other examples are also given of the analysis of inbred and cross progenies with respect to a variety of characters. Analysis of crosses made with test varieties is most useful when parents are being selected from a small quantity of partly known material; with larger quantities of unknown material, preliminary selection after a selfing test is necessary. As regards breeding for quality, the author points out the difficulties of defining and measuring properties which render a potato palatable; recent progress in this field and in breeding for resistance to diseases and pests is surveyed. It is suggested that breeding varieties with foliage suitable for fodder may be worthwhile.

4375 Jacobsen, B.
The potato breeding programme in Denmark.
Europ. Potato J. 1958 : **1** : No. 1 : 21–24.

The aims and achievements of the programme promoted by the Danish Agriculture Potato Fund, which was established in 1948, are outlined. Breeding varieties for fodder and industrial purposes, as well as for human consumption, is in progress, the two diseases which are receiving most attention being late blight and scab. Mention is made of a collection of wild and cultivated *Solanum* spp. at the Vandel station. The programme has resulted in about 25 new varieties which have been undergoing trial for two or more years. Three of the varieties have been submitted for official testing.

4376 Aardappels, 1958 (Interprovinciale proefvelden). [**Potatoes, 1958** (**Interprovincial trial fields**)].
Landbouwvoorlichting **15** : Bijl. 27; Ber. Rassenkeuze 1958 : No. 244 : Pp. 6.

Data on yield and earliness are presented for varieties tested on various soil types in the Netherlands since 1946.

Abstracts of papers presented at the forty-first annual meeting of the Potato Association of America.
Amer. Potato J. 1958 : **35** : 441–49.

4377 *Hougas, R. W., Peloquin, S. J. & Ross, R. W. Induced haploids in* Solanum tuberosum. (*p. 441*).

Ten selections of commercial potato were used as parents in interspecific matings with seven diploids. Twenty-nine haploids of *S. tuberosum* were found among the 800 seedlings resulting from over 6000 pollinations. The haploids, which were smaller than either the F_1 hybrids or their respective *S. tuberosum* parents, exhibited considerable variation in morphology, pollen fertility and degree of meiotic regularity.

4378 *Hougas, R. W., Peloquin, S. J. & Ross, R. W. The potential of haploid potatoes for research and breeding.* (*p. 442*).

Crosses between haploids of *S. tuberosum* and several tuber-bearing diploid *Solanum* spp. have been successful, a new approach for the transfer of desirable genes to the cultivated potato thus being made possible.

4379 *Robinson, D. B., Larson, R. H. & Walker, J. G.* Verticillium *wilt of potato.* (*pp. 444–45*).

[Cf. 3161.].

4380 *Umaerus, V. The relationship of peroxidase activity in potato leaves and resistance to* Phytophthora infestans. (*p. 447*).

A positive correlation was found between peroxidase activity and field resistance to *Ph. infestans* in *S. tuberosum*. Such a correlation was not found in *S. demissum* x *S. tuberosum* hybrids screened for field resistance in Mexico. It is suggested that field resistance as found in *S. demissum* and its derivatives may consist of resistance to infection, e.g. to penetration by the spores, whereas the field resistance of *S. tuberosum* may be due to resistance to spread of the pathogen in the leaf tissue.

4381 *Webb, R. E. & Schultz, E. S. Evaluating potato selections for resistance to potato virus A.* (*p. 448*).

The following greenhouse method has proved to be highly effective for isolating selections possessing field immunity from virus A. Plants are approach-grafted with seedling 41956 (immune from virus X). Selections showing top necrosis, a type of field immunity, were tested no further. About 30 days after grafting, the remaining selections were used for inoculating the virus-A indicator *S. demissum* 'PI175404'. Small bluish-black local lesions developed 4–6 days later on plants which had been inoculated by means of leaves from susceptible selections. These selections were then tested for immunity from aphid infection with virus A, infection being diagnosed from the results of inoculating the indicator host after an incubation period of 30–35 days.

4382 *Young, L. C. & Young, D. A. A study of the multi-genic type of resistance to* Phytophthora infestans. (*p. 449*).

Sixteen varieties and 299 seedlings were inoculated in the field with race 1,3,4, using a portable low-pressure sprayer. Ninety-four of the seedlings showed some degree of resistance; their parentages frequently involved Hindenburg, Richter's Jubel, USDA96–56, USDA46952 and President. Voran was the most resistant variety, followed by Parnassia, Alpha, President, Noordeling, Ackersegen, Hindenburg and Sebago in descending order. The results of another trial indicated that susceptibility increased with plant age in each of the 12 varieties and seedlings studied. A modification in field trials is therefore suggested so that all varieties will be at about the same stage of physiological development at the time of exposure to the pathogen.

4383 JESSUP, R. J.

Potato breeding in New South Wales.

J. Aust. Inst. agric. Sci. 1958 : **24** : 21–26.

The breeding, selecting and disease-screening methods used at the Glen Innes Experiment Farm are described.

4384 DE HAAN, H.

Geert Veenhuizen (1857–1930), the pioneer of potato breeding in the Netherlands.

Euphytica, Wageningen 1958 : **7** : 31–37.

This article gives biographical information concerning G. Veenhuizen, a list of the potato varieties developed by him, and an account of the celebration marking the anniversary of his birth.

4385 MAGOON, M. L., HOUGAS, R. W. & COOPER, D. C.

Cytogenetic studies of South American diploid Solanums section Tuberarium.

Amer. Potato J. 1958 : **35** : 475–94.*

In investigations at the Potato Introduction Station, Sturgeon Bay, Wis., *S. rybinii* x *S. saltense*, *S. tarijense* x *S. rybinii*, *S. phureja* x *S. rybinii*, *S. vernei* x *S. simplicifolium* and *S. rybinii* x *S. phureja* and the parental species showed a high degree of regularity in meiosis. Abnormalities such as univalents, quadrivalents, chromatin bridges and fragments, laggards, restitution nuclei and micronuclei were however observed in a small percentage of microsporocytes. The occurrence of occasional quadrivalents in some clones of certain of the species and in the hybrids suggests that a number of chromosomes may differ structurally. The formation of bridges and fragments, resulting from inversion heterozygosity or delayed separation of bivalents on account of difficulty in terminalization of chiasmata, provides further evidence of possible structural differentiation. In addition, the occurrence of univalents may be due to segmental and genetic disparities between homologous chromosomes. In view of the fact that 12_{II} were normally present, however, such structural differences cannot be extensive. Usually one nucleolus was seen at diacinesis. The rare occurrence of over four nucleoli was detected in *S. rybinii* x *S. saltense.* No evidence of secondary association at diacinesis in the parental species was obtained. Chromosome grouping was common from metaphase I to metaphase II, the frequency of various types of secondary association being variable within a species and between species.

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* Original article incorrectly paginated as 375–94.

4386 Lee, J. H. & Cooper, D. C.
Seed development following hybridization between diploid *Solanum* species from Mexico, Central and South America.
Amer. J. Bot. 1958 : **45** : 104–10.

Double fertilization took place between 24 and 48 hr. after *S. pinnatisectum* had been selfed or crossed with *S. chacoense, S. goniocalyx, S. kesselbrenneri* and *S. yabari.* The hybrid seeds aborted as the result of starvation of the embryo brought about by the early disintegration of the endosperm. No fertilization occurred in crosses of *S. pinnatisectum* with *S. macolae* and *S. simplicifolium.*

4387 Les variétés admises au contrôle, 1958. (**Varieties recognized in 1958**).
Pomme d. Terre franç. 1958 : **21** : No. 224 : 2–24.

Descriptive notes are provided of the 43 varieties of potato officially recognized during 1958.

4388 **New varieties included in the list of varieties.**
Potato News Netherlands (undated) : **7** : p. 16.

The following potato varieties have been included in the Netherlands 33rd Descriptive List of varieties of Field Crops [3574]. Pandora, a table potato, gives tubers of good to very good quality on heavy clay soils. Herkol and Dekama are both industrial potatoes; the former, which is moderately resistant to blight, gives high yields of starch on reclaimed peat soils and the latter, a late variety, gives high starch yields on all soils and shows very little attack by blight.

4389 Münster, J.
Assortiment officiel suisse des variétés de pommes de terre recommandables pour la culture en 1958. (**Official Swiss collection of potato varieties that can be recommended for cultivation in 1958**).
Publ. Sta. féd. essais agric. Lausanne 1957 : No. 544 : Pp. 16.

Notes are provided on the resistance to common diseases, agronomic characters and cooking quality of 19 varieties recommended for cultivation in Switzerland.

4390 van der Plank, J. E.
New potato variety BP.1.
S. Afr. J. agric. Sci. 1958 : **1** : 107–08.

Tested in Natal and the Eastern Free State, BP1 [(South Esk x Shamrock) x Saranac] has given good results. It is susceptible to late and early blights and leaf roll, but less so than Up-to-Date. It shows field immunity from viruses A, C and X, susceptibility to virus Y and scab, and immunity from wart. Reports on its cooking quality for several different purposes have on the whole been favourable.

4391 Rigot, N.
Une variété belge de pomme de terre: Électre. (**A Belgian potato variety: Électre**).
Rev. Agric., Brux. 1958 : **11** : 333–45.

The above variety [cf. XXVI, 1410] is described and the results are given of studies of its general performance and disease resistance; it is particularly resistant to viruses. Électre came from the cross Eigenheimer x Aquila.

4392 Magoon, M. L.
Cytogenetic studies of diploid Solanums, section Tuberarium.
Diss. Abstr. 1957 : **17** : Publ. No. 22,390 : 2127–28. (Abst.).

Meiosis was regular in a high proportion of the microsporocytes of *S. pinnatisectum, S. lanciforme, S. bulbocastanum, S. verrucosum, S. gibberulosum* and *S. jamesii* and of hybrids of these species. A small percentage of the microsporocytes of the species and hybrids had univalents, quadrivalents, chromatin bridges, fragments and other meiotic irregularities. It was concluded that the degree of nonhomology between the chromosome complements of the different species is limited. F_1 hybrids of *S. pinnatisectum* x *S. lanciforme* and *S. pinnatisectum* x *S. bulbocastanum* were highly sterile, but the F_1 of *S. pinnatisectum* x *S. jamesii* set a normal amount of seed. The occasional quadrivalents observed in *S. pinnatisectum* x *S. bulbocastanum* may not be an indication of chromosome homology but of structural changes since quadrivalents were not found in the hybrid between the more closely related species *S. pinnatisectum* and *S. jamesii.* The fertility of F_1 *S. verrucosum* x *S. gibberulosum* was normal. When the colchicine-induced tetraploid of this combination was crossed with Katahdin, seed set ranged from 0 to 900. A set of 19–21 seeds was obtained when the induced tetraploid of *S. verrucosum* was crossed with Katahdin.

4393 MAGOON, M. L., COOPER, D. C. & HOUGAS, R. W.
Cytogenetic studies of some diploid Solanums, section Tuberarium.
Amer. J. Bot. 1958 : **45** : 207–21.

Tabulated information is provided on the morphological characteristics and disease resistance where known of *S. pinnatisectum*, *S. bulbocastanum*, *S. pinnatisectum* x *S. bulbocastanum*, *S. cardiophyllum*, *S. pinnatisectum* x *S. cardiophyllum*, *S. jamesii*, *S. pinnatisectum* x *S. jamesii* and the reciprocal cross, *S. verrucosum*, *S. gibberulosum* and *S. verrucosum* x *S. gibberulosum*. Full details are also included of chromosome associations and other meiotic abnormalities occurring in the microsporocytes of both the species and hybrids; abnormalities were found in only a small proportion of the microsporocytes. It is thought that the presence of univalents is not entirely due to precocious separation but may also result from segmental or genetical differences between homologous chromosomes. In the species hybrids, structural differences between homologous chromosomes were not great for the maximum possible number of bivalents occurred in most cases, quadrivalents being only occasional. Chromosome irregularities found between clones of certain species may be due to these clones having had a hybrid origin. The nucleolus developed in an irregular manner; usually one nucleolus was present at diacinesis but more than two were found in some hybrids. On selfing, *S. jamesii*, *S. pinnatisectum* and *S. verrucosum* gave occasional seed balls, each berry containing a few seeds; the other species studied were self incompatible. F_1 progeny with *S. pinnatisectum* as one parent and either *S. cardiophyllum* or *S. bulbocastanum* as the other were highly sterile whereas *S. pinnatisectum* x *S. jamesii* had normal seed setting. It was therefore concluded that *S. pinnatisectum* is more closely related to *S. jamesii* than to the other two species; a morphological comparison supported this view. The F_1 of *S. verrucosum* x *S. gibberulosum* showed a good degree of fertility. A tetraploid of this hybrid, obtained by colchicine treatment, was crossed with clones of *S. tuberosum* 'Katahdin' and the number of seeds set varied from 0 to 900. When induced tetraploid *S. verrucosum* was crossed with clones of Katahdin, the set varied from 19 to 21 seeds. No clear correlation was found between seed sterility and meiotic irregularities in the species or hybrids.

4394 **Breeding in a special direction.**
Potato News Netherlands (undated) : **7** : 14–15.

New varieties undergoing preliminary trials and tests for disease resistance in the Netherlands included material suitable for second-crop cultivation. They have given yields of 8·5–10·5 tons per acre when planted after the rye harvest in the second half of July and lifted before the first frost, and have proved almost immune from blight. Since they are short-day plants it is thought that they may also be of use in equatorial regions.

4395 RUBIN, B. A. & SAVEL'EVA, O. N.
(A physiological description of potatoes reproduced from different portions of the tuber).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 83–92. [Russian].

The varieties Zarnica [Dawn] and Lorh were induced to form adventitious buds from different layers of inner tissues of the tuber. The plants raised from these buds developed tubers which differed from those of the initial varieties in the content of starch, sugar, cellulose, ascorbic acid and nitrogenous substances. These changes were transmitted to the later tuber generations.

4396 FRIMMEL, G.
Ein Beitrag zur Blütenphysiologie der Kartoffel. **(A contribution to the floral physiology of the potato).**
Bodenkultur 1958 : **10** : 20–26.

Flowering was studied in seven potato varieties at Linz, Austria. Varietal differences were noted in the average number of flowers in an inflorescence, peduncle length, and the number of fruits set per inflorescence. Some varieties showed a positive and other varieties a negative relationship between the number of flowers formed and the number of fruit set in an inflorescence; for the other varieties there was no correlation. The positive correlation was found in varieties with a short flowering period and only one inflorescence per shoot. Varieties with a longer flowering time and producing more than two inflorescences on a shoot differed in respect of when they produced most fertile pollen. In the variety Apta, the best pollen is produced in the first-formed inflorescence while for Suevia the pollen of the late inflorescences is more fertile.

4397 FRIMMEL, G. & EDER, N.
Untersuchungen über den Futterwert von Kartoffeln und die Möglichkeit der züchterischen Verbesserung desselben. (**Investigations on the fodder value of potatoes and the possibility of improving it by breeding**).
Bodenkultur 1958 : **10** : 34–40.

Information is provided on the content of digestible protein and starch in fifteen potato varieties investigated at Linz. Since considerable variation occurs in the protein content of different potatoes and since starch and protein content are not correlated, it is thought that a high protein content could be combined with high starch content to produce a valuable fodder variety. Protein content is however negatively correlated with yield.

4398 THRAN, P.
Wetter und Stärkegehalt. (**Weather and starch content**).
Kartoffelbau 1958 : **9** : No. 5 : Stärke Kartoffel. **3** : No. 3 : 2–4.

Observations made over a number of years in Schleswig-Holstein indicated that potato varieties may be grouped according to how their starch content is influenced by unfavourable weather conditions; varieties rich in starch are most affected. The starch content of short-day types is greatly affected by September weather whereas that of long-day varieties is more influenced by summer weather; day-neutral varieties, which store starch for a longer period, are influenced by summer and autumn weather. It is suggested that short-day varieties be improved by breeding for more stomata per unit area and other characters which would increase transpiration; the long-day types need their rate of transpiration reduced.

4399 RUDORF, W.
The significance of wild species for potato breeding.
Europ. Potato J. 1958 : **1** : 10–20.

The author surveys experience gained at the Max Planck Institute, Cologne-Vogelsang, with respect to the value of wild *Solanum* spp. in breeding for resistance to diseases and pests, reference being made chiefly to late blight, *Alternaria solani*, *Rhizoctonia solani* (*Pellicularia filamentosa*), scab, *Synchytrium endobioticum*, viruses, *Heterodera rostochiensis* and Colorado beetle. In addition, various problems, including photoperiodic reaction, encountered in interspecific hybridization of *S. tuberosum* are briefly considered. It has been found that after three or four back crosses the progenies resemble *S. tuberosum* in photoperiodic behaviour.

4400 MCKEE, R. K.
Assessment of the resistance of potato varieties to common scab.
Europ. Potato J. 1958 : **1** : 65–80.

A report is given of investigations carried out at the Nottingham University School of Agriculture, England, to study methods of assessing varietal reactions to *Streptomyces scabies* in the field and greenhouse. Tubers were classified with respect to the proportion of the surface affected by scab (cover score) and type of lesion (damage score).

In a field trial carried out on six varieties to evaluate methods of scoring, cover and damage scores were highly correlated, the use of either permitting separation of the varieties into resistant, susceptible and intermediate groups. In practice, cover scores were easier to record than the more subjective scores for damage. In cases in which incidence of infection is irregular and very low, however, damage scores may be more reliable than cover scores.

The incidence of infection on 18 introduced and British varieties was determined during a four-year period. On the basis of damage scores, the relative resistance of the varieties remained fairly constant from year to year, Ackersegen and Cayuga being notable for their very high degree of resistance.

In spite of the necessarily small number of plants tested in the greenhouse, estimates of resistance for individual varieties on the basis of damage or cover scores obtained in the field and upon exposure to a range of isolates in the greenhouse were in close agreement. It is noted that the methods described have also proved suitable for assessing resistance in progenies of crosses involving resistant varieties and in lines of *Solanum andigenum*.

Reliable recognition of resistant and susceptible varieties was not achieved by the ferric chloride and periderm tests.

Isolates varied greatly in pathogenicity but no evidence of physiological specialization was obtained.

4401 HÖPPNER, E. & GEIDEL, H.
Krautfäuleanfälligkeit unserer Kartoffelsorten. (**The susceptibility of our potato varieties to late blight**).
Kartoffelbau 1958 : **9** : 82–84.

Information is provided on the susceptibility to *Phytophthora infestans* shown by potato varieties cultivated in Federal Germany during 1955–7.

4402 RIGOT, N.
La Station de Recherches de l'État pour l'Amélioration de la Culture de la Pomme de Terre à Libramont. Programme général des travaux. **(The State Research Station for the Improvement of Potato Cultivation at Libramont. General programme of work).**
Rev. Agric., Brux. 1958 : **11** : 444–46.

At Libramont, special attention is being paid to breeding potatoes resistant to disease, use being made of New World species. Attempts were made to combine resistance to leaf roll, X, Y and A viruses with resistance to *Phytophthora infestans*; the success of these experiments has not yet been ascertained.

4403 SCHICK, R., MÖLLER, K. H., HAUSSDÖRFER, M. & SCHICK, E.
Die Widerstandsfähigkeit von Kartoffelsorten gegenüber der durch *Phytophthora infestans* (Mont.) de Bary hervorgerufenen Krautfäule. [**The resistance of potato varieties to late blight caused by *Ph. infestans* (Mont.) de Bary**].
Züchter 1958 : **28** : 99–105.

The collections of potato varieties at Gross-Lüsewitz was tested during 1955 to 1957 for field resistance to *Ph. infestans* and using 15 races of this pathogen, it was determined which *R* genes, if any, the different varieties carried. These results, together with similar information on other varieties not cultivated at Gross-Lüsewitz, are presented in tabular form. The Gross-Lüsewitz collection contained 61 varieties with the R_1 gene and seven with other *R* genes; these *R* genes had all been derived from *Solanum demissum*. No absolute correlation was found between *R* genes and field resistance, although the group of varieties carrying R_1 had a greater percentage of types with high field resistance than the *r* group. Considerable differences were noted within maturity groups in respect of field resistance; even some early types showed high resistance. It remains to be decided whether the field resistance shown at Gross-Lüsewitz, where only four races of *Phytophthora* are important, is equally active against all races.

4404 TOXOPEUS, H. J.
Note on the variation in expression of hypersensitivity to *Phytophthora infestans* in potato seedlings.
Euphytica, Wageningen 1958 : **7** : 38–40.

When young F_1 seedlings from crosses involving a parent carrying an *R* gene for hypersensitivity are sprayed with swarm spores of *Ph. infestans*, no difficulty is usually encountered in identifying susceptible and hypersensitive individuals, the latter having no mycelial growth and small necrotic lesions. In some cases, however, notably when a concentrated suspension of spores is used, hypersensitive seedlings develop large necrotic lesions and even a small number of conidiophores. If all plants showing necrotic lesions are considered as hypersensitive and the sparse development of mycelial growth is disregarded, segregation into susceptible and hypersensitive seedlings is close to the theoretical expectation. The following genetical test for the presence of *R* was carried out. New growth was stimulated on very severely damaged seedlings which were then grafted on tomato rootstocks and crossed with the susceptible variety Libertas as pollen parent. Seeds were obtained from two of the grafted plants and the F_1 seedlings were inoculated with spores of the same biotype causing necrosis in the mother plants. Half of the 80 seedlings from each cross showed abundant mycelial growth while the other half had more or less severe necrotic lesions and some conidiophores, as in the parent and its sister plants. Degree of necrosis is apparently governed by a series of minor genes modifying the major effect of *R* genes. The problem of whether these modifiers belong to the same series as those governing the degree of field resistance requires investigation.

4405 POOS, J. A. J.
Het Phytophthora-probleem bij de aardappelveredeling. **(The *Phytophthora* problem in potato breeding).**
Zaadbelangen 1958 : **12** : 99–101.

By means of a back-crossing programme, the factors R_1 and R_3 for blight resistance have been transferred from *Solanum demissum* to *S. tuberosum*. A further type of resistance, termed incubation resistance, appears to be associated with lateness in some *S. tuberosum* lines. In autumn-grown crops these lines, which lack R_1 and R_3, appear to be more resistant than some lines carrying R_1 or R_3. Some R_1 and R_3 seedlings, however, and particularly the latter, combine earliness with high resistance in both summer and autumn and it is suggested that in these the association between lateness and incubation resistance has been broken.

4406 SMOOT, J. J., GOUGH, F. J., LAMEY, H. A., EICHENMULLER, J. J. & GALLEGLY, M. E.
Production and germination of oospores of *Phytophthora infestans*.
Phytopathology 1958 : **48** : 165–71.

Isolates of *Ph. infestans* from North America, western Europe, South Africa and the West Indies were all members of only one mating group while isolates from Mexico belonged to two groups [XXVII, 4162, XXVIII, 669]. Single oospore isolates were obtained from pairings in culture between isolates from Mexico and the United States. The first, from a Mexican isolate of race 1,2 x race 3, reacted as race 0 while the second, from race 1,2 x race 1,4, reacted as race 1,4 although differing from it in some cultural characters. In both cases the single oospore isolates belonged to the same mating group as their United States parent.

4407 Moore, W. C.
The breakdown of immunity from potato wart disease.
Outlook on Agriculture 1957 : **1** : 240–43.

New and more virulent races of *Synchytrium endobioticum* have been found in Germany, Czechoslovakia, Italy, Russia and Newfoundland, attacking varieties previously immune.

4408 Vinogradskij, B.
(That which gives one more percent starch).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **3** : 41–42. [Russian].

Agricultural methods designed to raise the starch content in potatoes by 1–2% are discussed and some varieties rich in protein named. They include new high-yielding wart-resistant varieties such as Pobeda [Victory], Minsk, Vel'jaminovskij, Katjuša [Little Katja] and Četyrehsotka [Four-hundred] and a series of varieties bred at the Alcohol Institute which have reached an advanced trial stage. Among the latter many are resistant to wart, and Rossijskij [Russian] and several others are also resistant to *Phytophthora*.

4409 Robinson, D. B., Larson, R. H. & Walker, J. C.
Verticillium wilt of potato in relation to symptoms, epidemiology and variability of the pathogen.
Res. Bull. Univ. Wis. agric. Exp. Sta. 1957 : No. 202 : Pp. 49.

Investigations which have been briefly reported elsewhere are described in detail [cf. 3161].

4410 Lee, S. & Le Tourneau, D.
Chlorogenic acid content and Verticillium wilt resistance of potatoes.
Phytopathology 1958 : **48** : 268–74.

The amount of chlorogenic acid present in roots and leaves of seven potato varieties was determined. The resistant seedling 41956 contained more chlorogenic acid in its leaves than the other varieties but the order of values for the leaves of all the varieties did not correspond exactly to the order of resistance. As regards the roots, a clear correlation between chlorogenic acid content and resistance to wilt was found. The role of chlorogenic acid in conferring resistance was discussed but further investigations are necessary before a conclusion may be reached.

4411 Jones, F. G. W.
Resistance-breaking populations of potato root eelworm.
Plant Path. 1958 : **7** : 24–25.

During 1956, potatoes bred from *Solanum tuberosum* ssp. *andigenum* were tested with 20 populations of *Heterodera rostochiensis* at Rothamsted, England; 14 of these populations contained forms capable of breaking the resistance of the F_1 hybrid Z3/7. A further 25 populations were studied in 1957 and 17 of these were aggressive to some hitherto resistant potatoes; B_1 hybrids were more susceptible than F_1 hybrids. *S. vernei* was resistant to all 25 populations and to 12 other populations collected in 1956.

4412 Toxopeus, H. J.
Over de aard van de resistentie tegen het aardappelcystenaaltje en over het nieuw opgetreden ras van deze parasiet. (**On the nature of resistance to potato root eelworm and the race of this parasite which has recently appeared**).
Zaadbelangen 1958 : **12** : 68–71.

The life cycle of the potato root eelworm is outlined and the difference in reaction to larval invasion between resistant and susceptible plants described. The discovery of a new race in England, Scotland and the Netherlands, which is aggressive on previously resistant varieties, is reported.

Testing for resistance to the new race is in progress at Wageningen, Netherlands, and as resistant lines are found they are crossed with CPC1673 and *Solanum andigenum* lines showing resistance to the old race.

4413 Ellenby, C.
Day length and cyst formation in the potato root eelworm, *Heterodera rostochiensis* Wollenweber.
Nematologica, Leiden 1958 : **3** : 81–90.

In the greenhouse experiments described, three varieties of potato were inoculated with cysts of *H. rostochiensis*. Under short day conditions, more cysts were found on Majestic than on Redskin and Doon Star but with a long photoperiod Majestic had fewer cysts than the other two varieties. These differences are thought to be related in some way to the reaction of the varieties to the photoperiod.

4414 Williams, T. D.
Potatoes resistant to root eelworm.
Proc. Linn. Soc. Lond. 1958 : **169** : 93–104.

Experiments at the School of Agriculture, Cambridge, England, indicated that the general root diffusates from plants of *Solanum tuberosum* ssp. *andigenum* resistant to *Heterodera rostochiensis* resembled susceptible cultivated potato varieties in possessing a high stimulatory effect on rate of larval emergence from cysts. Diffusates from *S. vernei* had low hatching activity. In resistant plants of ssp. *andigenum*, as well as in susceptible plants of Majestic, a rapid initial invasion of the roots by the larvae was detected, reaching a maximum 20 days after the first appearance of shoots, but in the resistant plants the maximum number of larvae per ft. of root was lower and the rate of subsequent decline in number of invading larvae more rapid. In addition, very few developing females were found in the resistant plants, although many males appeared to reach maturity. In *S. vernei*, the rate of larval invasion was low. According to the results of field trials of resistant lines from ssp. *andigenum* x cultivated potato and the susceptible varieties Majestic and Ulster Chieftain on an infested site in Norfolk and observations from pot experiments, resistant potatoes reduced the initial level of the eelworm population. Data from field and pot tests showed that resistant plants were adversely affected in their growth, as expressed by yield, by larval invasion. Giant cells disrupting the phloem have been found to be associated with developing ♂ larvae in resistant plants; whether the plants are injured in other ways is not known. The injury sustained by resistant plants does however appear to be less than that suffered by susceptible ones. Problems of breeding for resistance are briefly discussed with reference to these results and to variation in pathogenicity of the pathogen [cf. XXVII, 4164].

4415 Wilski, A.
Próby hodowli odmian ziemniaka odpornych na mątwika ziemniaczanego (*Heterodera rostochiensis* Woll.) [**An attempt to breed a potato variety resistant to potato root eelworm (*H. rostochiensis* Woll.)**].
Postępy Nauk Roln. 1954 : No. 6 : 40–45.

A review of Netherlands, German and English work on the development of eelworm-resistant potatoes by means of interspecific hybridization between cultivated varieties and *Solanum vernei* and *S. andigenum* is presented.

4416 van der Laan, P. A. & Huijsman, C. A.
Een waarneming over het voorkomen van fysiologische rassen van het aardappelcystenaaltje, welke zich sterk kunnen vermeerderen in resistente nakomelingen van *Solanum tuberosum* subsp. *andigena*. (**A note on the occurrence of physiological races of potato root eelworm which are able to multiply vigorously in resistant progeny of *S. tuberosum* subsp. *andigena***).
Tijdschr. PlZiekt. 1957 : **63** : 365–68.

Cuttings of varieties of *S. tuberosum* ssp. *andigenum* resistant to Netherlands races of root eelworm were attacked when the soil was inoculated with cysts of Peruvian origin.

4417 Bukasov, S. M.
Das Ausgangsmaterial für die Züchtung der Kartoffel—insbesondere gegen den Koloradokäfer resistenter Sorten. (**Initial material for potato breeding, especially for varieties resistant to the Colorado beetle**).
Züchter 1958 : **28** : 65–70.

Criticisms are presented of Hawkes's classification of the tuber-bearing potatoes and Brücher's revision of the *Commersoniana* series [cf. XXVII, 151 and 662]. Both Hawkes and Brücher united within single species forms which were previously given specific status; the author disagrees with these views in certain cases where the forms so treated are naturally isolated from each other on account of their habitats. The status of the species *Solanum subtilius* is discussed in detail.

It is also considered that most cultivated species, such as *S. andigenum*, *S. tuberosum* and *S. stenotomum*, had a polyphyletic origin and that diploids such as *S. rybinii*, *S. phureja* and *S. ajanhuiri* had a different and independent origin.

Reference is made to some of the South American wild potatoes which are of possible breeding value and special mention is made of those species showing resistance to Colorado beetle. In this respect, *S. macolae* and members of the *Commersoniana* series are particularly interesting.

4418 Bagnall, R. H. & Bradley, R. H. E.
Resistance to virus Y in the potato.
Phytopathology 1958 : **48** : 121–25.

Potato varieties responding with a necrotic reaction in greenhouse tests at Fredericton, New Brunswick, Canada, showed field resistance under conditions in which susceptible varieties developed mosaic symptoms. Seedling F4519 and Kennebec showed outstanding field resistance and seedling F451, Canso and Irish Cobbler were moderately field resistant.

4419 EASTON, G. D.
Virulence of potato virus Y isolates and immunity in the genus *Solanum*.
Diss. Abstr. 1957 : **17** : Publ. No. 24,276 : p. 2370. (Abst.).

The results summarized include the following: *S. stoloniferum*, *S. antipoviczii* and *S. tlaxcalense* were immune from virus Y, when inoculated mechanically, by aphids or by grafting. Thirteen out of 22 clonal tuber lines of interspecific hybrids were immune when inoculated mechanically or by grafting. Nineteen of the 22 lines had *S. stoloniferum* as one parent. Six of the 19 lines were susceptible when mechanically inoculated. Hybridization between 13 immune interspecific hybrids and *S. tuberosum* failed. The one surviving chromosome-doubled seedling obtained by treating 11 immune 48-chromosome species with colchicine-agar was crossed with *S. tuberosum* but the seeds failed to germinate.

4420 SILBERSCHMIDT, K.
Uma doença do tomateiro em Piedade causada pelo virus Y da batatinha. (**A disease of tomatoes in Piedade caused by potato virus Y**).
Arq. Inst. biol., S. Paulo 1956 : **23** : 125–50.

A virus found in tomatoes in the Piedade region of Brazil is described. When it was inoculated on to a number of other species, including several cultivars of domestic potato and 11 hybrids of *Solanum tuberosum* x *S. demissum*, no symptoms appeared in any of the potatoes. Though its general characteristics are those of potato virus Y it does not correspond to any known variant of this virus.

4421 **CaroGold sweetpotato for South Carolina.**
What's New Crops Soils 1958 : **10** : No. 7 : p. 27.

CaroGold is a new variety which equals Porto Rico in baking quality and is superior in yield, appearance and resistance to *Fusarium* wilt; also it produces fewer cracked tubers than the other varieties tested at Clemsen and Edisto. It is slightly later than Porto Rico and produces half as many sprouts per bushel of seed tubers. The tubers are of good shape with orange flesh and golden skin.

4422 ELMER, O. H. & MILLER, J. C.
The sweetpotato variety Lakan.
Rep. Kans. agric. Exp. Sta. 1958 : No. 8 : Pp. 4.

This variety was developed at the Louisiana Agricultural Experiment Station from the cross (Unit I x Pelican Processor) x (Mameyita x L4–6) and has done well in Louisiana and Kansas. It gives good yields of roots of satisfactory size when soil and climatic conditions are favourable and is of medium-late maturity. It has a high content of carotene and is of good cooking quality and excellent storage quality. In the hotbed, sprout production is good, the sprouts being sufficiently sturdy for mechanical planting. Lakan possesses greater wilt resistance than varieties of the Porto Rico or Jersey type and has so far been little affected by other diseases in the field, although detailed tests have not been made.

4423 FUJISE, K., YANOUE, T. & CHISHIKI, T.
(**Studies on self and cross incompatibility in the sweet potato. V. On flowering and seed setting in self-compatible varieties and in their selfed progenies**).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 130–32. [Japanese].

Capsule set declined from the S_0 to S_2 in lines of the variety Nakamurasaki [Mid Purple]. In a collection of 18 varieties and F_1 intervarietal hybrids, capsule set varied from 16·2 to 89·9% following selfing. Information is provided on the cross compatibility groups of the 18 forms just mentioned. All belonged to groups B, C or some other group; none pertained to group A. Some plants in group C were also self compatible. Matings were made for all combinations of eight plants representing the S_0 to S_2 of strain K13 of Nakamurasaki and two of its hybrids. It was noted that parent-offspring matings were usually compatible.

FIBRES

4424 Activité de l'I.R.C.T., 1955. (**The work of the Institute for Research on Cotton and Exotic Textiles, 1955**).
Cot. et Fibr. trop. 1957 : **12** : 1–171.

This report deals mainly with cotton breeding and cotton variety trials in French Africa. Some account is also given of breeding of sisal, ramie, *Urena lobata* and *Hibiscus cannabinus*.

French Equatorial Africa.

The variety Banda 2 has given a satisfactory performance and B1439, which is tolerant of

Fusarium vasinfectum, has been multiplied. Tabulated data are provided on lines selected at the Bambari Station; the most promising of these are natural hybrids of the families 2631 and 1634 and Réba TK–1 which is highly resistant to *F. vasinfectum*. Breeding for resistance to *Xanthomonas malvacearum* was continued and a series of new hybrids were tested. The B_1 gene was found to be associated with a discoloration of the cotyledons followed by variegation of the first leaves; later the coloration became normal. The genes B_2 and B_3 appeared to be independent in crosses involving Allen 51–296 but in crosses with N'Kourala 14E413, an average percentage recombination of 32 was found. Amongst F_3 progeny from the cross Banda x U4–5143 x 51–296, some lines showed black-arm resistance which could not have been conferred by either B_2 or $B_2 + B_3$; it therefore seemed possible that a new resistance factor X was present and that this probably came from U4–5143. The gene combination $B_2 + B_3$ conferred the greatest degree of resistance to *X. malvacearum*. At Bossangoa, lines of B185 (Banda x NK42–5) gave interesting results and the line E40 surpassed Allen 150K in yielding capacity but is susceptible to black arm. A number of new lines proved superior to the standard 58–151 in tests held at the Tikem Station. Studies are in progress on the inheritance of various seed characters. At Bebedjia pedigree selection was continued; in one set of trials, A–150 gave a yield of fibre superior to that of Allen by 40%; several other varieties are also mentioned for their high productivity.

French West Africa.

Some selections of *Gossypium barbadense* from the Ivory Coast and Togo gave promising results at Bouaké and some progress was made in breeding lines for increased fibre length. Mono lines have again yielded well. In the trials of *G. hirsutum* cottons, A58, A150 and N'Kourala types gave the best results. Tabulated information is provided on morphological and agronomic characters and flowering of cottons of the *marie-galante* and *punctatum* types. Some lines descended from crosses between local *punctatum* forms and N'Kourala were bulked at M'Pesoba-Koutiala and from one cross, *punctatum* x Az58–333–154, back-cross lines were selected with an average halo length of 29·57 mm. Selection also continued with Upland and Budi cottons.

French North Africa.

At the Tadla Station, Morocco, three promising lines of Pima 67 are being used to form the basis of a new variety. Several other new lines of Ashmouni and Menoufi are being retained on account of their productivity and fibre length; Pima 67 x Ashmouni (H47DE) has a fibre length superior to that of Ashmouni and is also high yielding. Details are provided of the yielding capacity and technological characters of a series of recent hybrids; some new crosses were made in 1954 and 1955. Pima 67 x Amoun has given high yields of strong fibre; varieties of *G. hirsutum* were also tested. Pima 67M153 and Acala 1517C were compared in respect of flowering; the latter had more flowers but shedding was greater than in Pima 67M153, which suffered less from attack by *Earias insulana*. Dendera surpassed four other varieties in trials held at various stations of Algeria where reselection of the varieties Ashmouni, Giza 31 and Menoufi is also in progress.

Madagascar.

Selections were made of Stoneville 2B and Acala 4–42.

4425 Al-Jibouri, H. A.

Estimates of genetic and environmental variances and covariances for certain quantitative characters in an interspecific cotton cross.

Diss. Abstr. 1957 : **17** : Publ. No. 24,236 : p. 2349. (Abst.).

Relative to the magnitude of the total phenotypic variance, the genotypic variance was large for fibre strength and low for lint yield in advanced generations of an unspecified interspecific cross. Genotypic variances for other traits ranged between those for fibre strength and lint yield. Although the genotype x locality interaction variance was significant for weight per boll, seed index, lint index, lint yield, "fibre upper half mean, elongation, and shape factor," its magnitude was small relative to the genotypic variance. Lint yield was positively correlated with seed index, fibre strength (T_0 and T_1), fineness and shape factor. A high negative correlation was detected between fibre strength and weight per boll, lint index, elongation and shape factor. Fibre upper half mean length was significantly correlated with seed index. Estimates of genetic progress in lint yield expected from the use of various selection indexes indicated that selection based on combinations of characters would be more efficient than selection based on lint yield only. The assignment of relative economic weights to the traits used in a selection index may be expected to increase the genetic advance.

4426 Sahasrabudhe, V. B. & Agarwal, K. N.
A note on double rectangular lattice designs for cotton varietal trials.
Indian Cott. Gr. Rev. 1958 : **12** : 95–97.
The efficiencies of randomized-block and double rectangular lattice designs (3 x 4, 4 x 5, 5 x 6 and 6 x 7) for cotton varietal trials were compared. Although the incomplete block design proved the more efficient in many cases, this superiority does not hold when optimum conditions of layout are observed.

4427 **(A joint scientific session on cotton).**
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 153–54. [Russian].
Breeding methods including interspecific hybridization were among the topics discussed at a recent conference in Taškent. Mention is made of early large-bolled and productive varieties with fibre of improved quality now available at most Soviet breeding stations, with some showing resistance to bacteria and fungi.

4428 Kesava Iyengar, N. & Santhanam, V.
Contributions to superior germ plasm in cotton. 1. Length improvement in Madras cottons.
Indian Cott. Gr. Rev. 1958 : **12** : 75–76.
Progress made in developing strains of Cambodia (*Gossypium hirsutum*) and Karunganni (*G. arboreum*) with longer staple is surveyed. It is hoped that Cambodia and Karunganni strains with a staple length of 1⅛ and 1 in. respectively will shortly be available for commercial use.

4429 Pandya, P. S., Majumdar, P. N. & Desai, K. B.
Breeding for fibre length in *herbaceum* cotton.
Indian Cott. Gr. Rev. 1958 : **12** : 77–79.
A short historical account is given of breeding carried out on *Gossypium herbaceum* at the Agricultural Research Station, Surat, Bombay State. Although considerable improvement in yield, ginning percentage and disease resistance has been achieved, the increase in staple length is only 10% (from 0·85 to 0·95 in.). Selections from crosses between strains developed at Surat have however a staple length of 1 in. or slightly more.

4430 Murthy, K. S., Rao, M. V. & Rao, C. J.
A brief résumé of progress made in the improvement of Westerns cotton.
Indian Cott. Gr. Rev. 1958 : **12** : 85–87.
Improvement of the Westerns type (*Gossypium herbaceum* var. *acrifolium*) grown in Andhra and Mysore is surveyed. Improvement over Westerns 1 is being sought by crossing the variety with 1027ALF and other cottons from Bombay State. Promising selections have been obtained which show advances in both lint length and ginning percentage.

4431 Joshi, V. K.
Progress of cotton breeding in Oomras tract of Hyderabad State and future prospects.
Indian Cott. Gr. Rev. 1958 : **12** : 150–55.
Improvement of *Gossypium arboreum* race *bengalensis* is surveyed. In the Parbhani district, the strain Daulat, derived from Gaorani 12, is becoming popular on account of its high ginning percentage (36·8%) but in unfavourable seasons is outyielded by the unimproved local cotton [cf. 184]. Seven strains recently selected from Gaorani 12 show superiority to Daulat in one or more respects. In view of the variability in seasonal conditions, use of a composite of strains superior to Daulat is recommended.
As shown by trials at Badnapur in the Aurangabad district, Gaorani 12, Daulat and 197–3 from Khandesh are unsuitable for this tract, where drought prevails in September. Some selections of Gaorani 12 have however given encouraging results with respect to yield or technological properties.

4432 Seshadri Ayyangar, G., Nageswara Rao, P. & Venkatachary, B.
Potentialities of perennial cottons with special reference to Andhra area.
Indian Cott. Gr. Rev. 1958 : **12** : 160–64.
On the basis of a review of information on the perennial cottons, a survey of these types in Andhra and other parts of India is advocated in order to discover (1) types suitable for the development of cotton which will meet the increasing demand for varieties suitable for the hand-loom industry, and (2) sources of genes for resistance to diseases and pests and for other desirable characters with a view to improving annual cottons.

4433 Delattre, R.
Rapport de mission au Soudan (ex Soudan Anglo-Egyptien), 15 octobre – 15 décembre 1954. [**Report of a mission to the Sudan (formerly the Anglo-Egyptian Sudan), 15 October – 15 December 1954**].
Cot. et Fibr. Trop. 1957 : **12** : 208–65.
A survey is given of the genetical and breeding work with cotton carried out in the Sudan; breeding for resistance to black-arm leaf curl

and jassids, tolerance of saline soils and reduced or deciduous bracts is mentioned. The results of varietal trials are also reported.

4434 Iltis, J.
Résultats de quatre années de sélection et d'essais variétaux à la Station cotonnière du Tadla (Maroc). [**Results of four-years breeding and varietal trials at the Cotton Station of Tadla (Morocco)**].
Cot. et Fibr. Trop. 1957 : **12** : 191–207.

The results are reported of trials of new selections and hybrids of *Gossypium barbadense* and varieties of *G. hirsutum*. Pima 156 has proved more productive than Pima 67 which is the only variety cultivated in Morocco. Some selections from Ménoufi and Ashmouni gave promising yields, although they did not equal Pima 67; two lines of Ménoufi had a good Pressley index. The hybrid Pima 67 x Ménoufi was early and more productive than Ménoufi; Pima 67 x Amoun had particularly strong fibre and was earlier and yielded more than Amoun. Other hybrids, with Pima 67 as one parent, have also shown promise in respect of yielding capacity or fibre quality.

4435 Méndez R., E. D.
Creación de variedades de algodón, campaña 1955–56. (**Production of new varieties of cotton, season 1955–56**).
Bol. trimestr. Exp. agropec., Progr. Coop. Exp. Agropec., 1957 : **6** : No. **2** : 4–8.

This article has already been summarized from another source [716].

4436 Negi, L. S. & Ajaib Singh Aujla.
Progress in the breeding of extra long-staple cotton in the Punjab.
Indian Cott. Gr. Rev. 1958 : **12** : 133–37.

Strains of *Gossypium hirsutum* have been developed which are superior to 320F in fibre length, ginning percentage and spinning performance, and at least equal to this standard variety in yield. LL54 appears to be the most promising, followed by LL53 and LL43 [cf. 1847]. LL54 has a mean fibre length of 1·07 in., ginning outturn of 35·9% and spinning value of 48 HSWC. Breeding is now aimed at the development of strains with a fibre length of 1⅛ in. and more and with the capacity to spin above 50 HSWC. Advanced-generation progenies ranging in fibre length from 1·12 to over 1·25 in. and surpassing 320F in ginning performance are already in hand.

4437 **Cotton research in Punjab results in two long staple American cottons—LL. 53 and LL. 54.**
Indian Cott. Gr. Rev. 1958 : **12** : 181–82.

A note is given on the above two strains which have shown superiority over 320F in fibre properties, ginning percentage and yield over four seasons [4436]. Extensive trial of the strains on cultivators' holdings is necessary, particularly in areas which will be affected by the Bhakra-Nangal irrigation project.

4438 **Chemical route to cotton hybrids.**
Agric. Res., Wash. 1958 : **6** : No. **10** : p. 6.

A popular account is given of work previously summarized [1856].

4439 **Hybrid cotton production now on the way.**
What's New Crops Soils 1958 : **10** : No. 6 : p. 11.

The possibility of commercial production of cotton hybrids by the use of chemically induced male sterility is discussed. Using sodium α,β-dichloroisobutyrate, 62 to 88% of hybrid seedlings were obtained at Riverside, Calif., from Empire, Amsak F_{18} and Pima 5–1 but in the case of Acala 4–42 the gametocide had little effect. It is suggested that advantage could be taken of such varietal differences in response in the large-scale production of hybrid seed.

4440 Bhat, N. R. & Patel, C. T.
A study of the sympodial habit in an interspecific cross in *Gossypium*.
J. Indian Bot. Soc. 1957 : **36** : 523–34.

Investigations were carried out on the selfed and back-crossed progenies of a single plant with sympodial habit found in the otherwise monopodial F_4 progeny of (*G. herbaceum* '1A Long Boll' x *G. anomalum*) doubled and twice back crossed to *G. herbaceum* 'BC1–2'. The plants were classified for habit according to whether (1) most of the main branches were sympodial or monopodial and (2) branching was initiated with a sympodium or monopodium. The data suggested that sympodial habit was caused by a recessive gene and by another epistatic to the dominant one for monopodial growth. Plants monopodial in appearance produced the first sympodial branch at a higher node than those classified as sympodial. The tendency to develop the first sympodial branch at a lower node appeared to be partially dominant and polygenic.

4441 WEAVER, J. B. (JUN.).
Embryological studies following interspecific crosses in *Gossypium*. II. *G. arboreum* x *G. hirsutum*.
Amer. J. Bot. 1958 : **45** : 10–16.

Endosperm growth was normal for four days after crossing *G. arboreum* as ♀ with *G. hirsutum* but on the fifth day numerous dumbbell-shaped pairs of nuclei were observed in the free-nucleate endosperm. This nuclear condition is attributed to the formation of chromosome bridges. The embryos often attained one-fifth normal size but failed to differentiate properly. Cultured embryos continued to show the undifferentiated type of growth. The maternal tissue grew normally until after endosperm failure. The embryological behaviour of this cross is markedly dissimilar to that reported for the reciprocal [XXVII, 4183].

4442 IRVINE, J. E.
Studies on the development of ovules of *Gossypium hirsutum* and *G. klotzschianum* v. *davidsonii* and their failure in interspecific crosses.
Diss. Abst. 1957 : **17** : Publ. No. 22,895 : 2388–89. (Abst.).

Chemical and anatomical studies were carried out on ovules in the above species and in *G. hirsutum* pollinated by *G. klotzschianum* var. *davidsonii*. Ovule development in the two species was similar, except for the more rapid rate of development and smaller size of all the structures in *G. klotzschianum*. The hybrid embryos grew normally for the first three weeks after pollination. Schizolysigenous glands failed to appear during the fourth week and necrosis of the cotyledons set in.

4443 SANTHANAM, V.
A brief review of the progress in the utilisation of wild species of *Gossypium* for the improvement of cultivated cottons in Madras.
Madras agric. J. 1958 : **45** : 142–45.

In selecting back-cross progenies of the cross between *G. anomalum* and Karunganni cotton (*G. arboreum*) at the Cotton Breeding Station, Coimbatore, the maximum standard of fineness has been fixed at a mature fibre weight of 1·40 x 10 g./cm. and swollen hair diameter of 20·0 μ, as against the respective values of 2·10 and 25·0 in Karunganni. Many plants possessing this standard and a fibre length transgressing the parental values have been isolated.
A colchicine-induced hexaploid was synthesized from *G. hirsutum* x *G. raimondii* and twice back-crossed to the Cambodia strain MCU1. Selection up to the F_8 has resulted in the development of progenies equal in yield of seed cotton to MCU1 but superior in halo length and ginning percentage.

4444 ANSARI, M. A. A.
Some records on *G. Stocksii*.
Pakist. Cott. 1958 : **11** : No. 2 : 27–32.

Some notes are given on *Gossypium stocksii* in Sind, suggesting that a well-organized survey of the species in this area merits consideration. Observations on an introduction of a colchicine-induced amphidiploid of *G. stocksii* x *G. arboreum* from the USA further suggest that hybridization of the wild species with cultivated Asiatic cottons might result in the development of varieties improved in resistance to diseases, pests and drought.

4445 GERSTEL, D. U. & PHILLIPS, L. L.
Segregation in new allopolyploids of *Gossypium*. II. Tetraploid combinations.
Genetics 1957 : **42** : 783–97.

Segregation ratios in a series of synthetic allotetraploids widened markedly as the cytotaxonomic affinity of the component species decreased, the chief testers used being *G. hirsutum*, *G. barbadense* and 4*n* *G. arboreum* [cf. XXVI, 3517]. The gametic ratio obtained for five loci in 4*n* (*G. arboreum* x *G. herbaceum*) was 5 : 1 or narrower. The chromosomes in this allotetraploid therefore showed no tendency to associate preferentially. When tested as ♂ parent in a cross with 6*n* (*G. hirsutum* x *G. thurberi*), 4*n* (*G. thurberi* x *G. raimondii*) gave a ratio of approximately 13 : 1 for segregation at locus R_1^{RAI}. Pairing of the chromosomes in meiosis is normal in both of the above allotetraploids. The difference in segregation ratios between the 4A and 4D combinations therefore indicates the greater sensitivity of allotetraploid segregation, compared with F_1 pairing, to small differences in chromosome homology. Data obtained for 4*n* (*G. arboreum* x *G. anomalum*) and 4*n* (*G. anomalum* x *G. herbaceum*) revealed very wide ratios for the five loci tested, while 4*n* (*G. arboreum* x *G. thurberi*) showed no segregation for two characters and hardly any for the third character studied. P_a (yellow pollen), R_2 (red plant), Y_a (petal colour) and L for leaf shape were inherited independently, as indicated by data from the combinations of Old World species and *G. anomalum.*

4446 KAIWAR, S. R.
Inheritance of a narrow leaf and a lintless mutant in cotton.
Indian Cott. Gr. Rev. 1958 : **12** : 165–68.

Narrow leaf in a mutant from a *Gossypium hirsutum* x *G. barbadense* cross behaved as a simple recessive (l^n) to normal broad leaf. Lintlessness in a mutant of Punjab American 289F (*G. hirsutum*) depended upon genes designated l^1l^2. The mutant characters were inherited independently of each other and of flower colour (Y_1), flower spot due to R_2^{AO} or R_2^{AS}, and pollen colour (Pp). Narrow leaf also segregated independently of the gene pair F^nf^n for fuzz. Lintlessness was linked with the fuzzless condition (F^n) with a cross-over value of 2·87%.

4447 MILLER, P. A., WILLIAMS, J. C. (JUN.), ROBINSON, H. F. & COMSTOCK, R. E.
Estimates of genotypic and environmental variances and covariances in Upland cotton and their implications in selection.
Agron. J. 1958 : **50** : 126–31.

Ten characters were studied in populations of F_4 and F_5 lines derived from Deltapine 11 x Rowden, Stoneville 2B x Rowden and Coker 100 x Acala 1517. The characters comprised lint yield, lint percentage, boll number per plant, seed index, lint index, seed number per boll, boll weight, and fibre length, strength and fineness. Environmental variances as measured by the plot error were large for lint yield, boll number, seed number and boll weight, and small for the remaining characters. The magnitude of the genotype x environment interaction component was generally small in relation to that of the corresponding genetic variance component for most of the traits, although the line x locality x year interaction components for lint yield and boll number in the case of Deltapine 11 x Rowden were sufficiently large to be of significance from the point of view of breeding. Sufficient genetic variability was present in all populations to offer scope for appreciable genetic advance through selection for each of the ten characters. In all populations, lint yield was highly and positively correlated with lint percentage and boll number, and negatively correlated with seed index and boll weight. Utilizing the information provided by the variance and covariance relationships, several selection indices for lint yield were devised and evaluated. An index comprising lint percentage, boll number and seed index in addition to yield itself appeared to be useful.

4448 **H.14—the new superior American cotton for the Hariana tract of Punjab**
Indian Cott. Gr. Rev. 1958 : **12** : p. 105.

Released as a substitute for 216F, H14 is superior to this variety in yield, fibre length, ginning outturn, spinning performance and monetary return per acre. It has in addition proved to be jassid resistant and earlier maturing.

4449 **A new cotton variety.**
Indian Fmg. 1958 : **8** : No. 1 : p. 17.

The variety, named 35/1, is recommended for Uttar Pradesh, where it has yielded 714 pounds of kapas and 264 pounds of lint per acre. The staple length in the 32nd inch is 26, ginning percentage 37 and spinning performance 16.

4450 ALEKSANDROV, A. S.
(Cotton seed production in the USSR).
Agrobiologija (Agrobiology) 1957 : No. 6 : 76–80. [Russian].

Mention is made of new cotton varieties obtained by selection on seed farms in Central Asia. They include the high yielding variety 450/555, selected from S450; KR2, a selection from 108F from which it is distinguished by improved resistance to lodging and a higher ginning percentage; and 1306DV, with a larger boll and longer staple than 1306. The last mentioned form was selected among the progeny of a natural hybrid of 1306. Reference is made to improvements in lint length, boll weight and breaking length of fibre in 611b. This variety is 3–7 days earlier than 1306, which is grown in the northern cotton-growing districts, and outyields it by 10–25%.

4451 GUTKNECHT, J. & ROUX, J. B.
La multiplication des variétés Allen 150 et 151 au Tchad. **(The multiplication of the varieties Allen 150 and 151 in the Chad).**
Cot. et Fibr. Trop. 1957 : **12** : 173–90.

Allen 150 and 151 have now replaced the variety Allen in the Chad area of French Equatorial Africa; both the new varieties outyield Allen and are more hardy and more adaptable to varied environments. The length, strength and fineness of the fibre are in both cases satisfactory.

4452 DEL CARPIO B., R. & BOZA BARDUCCI, T.
Cñ. 281–51 : reciente selección de algodón Tangüis producida por la Estación Experimental Agrícola de Cañete de sobresalientes cualidades agrícolas e industriales. **(Cñ 281-51 : a recent selection of Tangüis cotton produced by the Agricultural Experimental Station of Cañete and showing outstanding agronomic and industrial qualities).**
Circ. Estac. exp. agríc. As. Agric. Cañete 1955 : No. 1 : Pp. 5. (Mimeographed).

Data on the performance of the above variety in comparison with Cñ 550–48 and PC–46 are given. Although less resistant than PC–46 to soil-borne pathogens, Cñ 281–51 is highest in yield and in weight of fibre per boll. In fibre percentage and staple length it is intermediate between the other two.

4453 BROWN, M. S.
The division of univalent chromosomes in *Gossypium*.
Amer. J. Bot. 1958 : **45** : 24–32.

Occasional division of univalents has been observed at metaphase I in a wide range of *Gossypium* material. Centric fragments and heteromorphic bivalents, whose origin is attributed to univalent division, have been recovered from monosomic lines. It is pointed out that centric fragments (1) restore the $2n$ centromere number and thus the stability of a monosomic line, (2) may be of value in chromosome identification and gene mapping, and (3) may have evolutionary significance in the origin of minor changes in the chromosome complement.

4454 KING, H. E. & LEE, B. J. S.
Genetic differences in vitality of cotton plants cut back at the end of a season.
Emp. Cott. Gr. Rev. 1958 : **35** : 185–86.

A wide range of heritable variation in the survival and sprouting of stumps has been found among progenies of the Upland cotton Samaru 26C studied in northern Nigeria. Capacity to regrow and yield before cutting back were not correlated. Strains with a reduced tendency of regrowth are desirable since more effective methods of destruction, such as uprooting, after harvesting are hardly practicable from the commercial point of view in northern Nigeria. The observed variation suggests that scope exists for selection for reduced growth.

4455 HUDAJKULIEV, A.
(The influence of pollination conditions for cotton upon the formation of inheritance in hybrids).
Izv. Akad. Nauk Turkm. SSR (News Acad. Sci. Turkm. SSR) 1957 : No. 1 : 64–71. [From Ref. Ž. (Ref. J.) 1957 : No. 23 : p. 25. (Abst.)]. [Russian].

This report on intervarietal hybridization of cotton suggests that progenies differing with regard to lint length, maturation period and other heritable characteristics can be obtained from the same cross merely by (1) pollinating flowers from different positions on the plant or (2) carrying out pollination at different times.

4456 **Summary of fiber and processing test results on some varieties of cotton grown by selected cotton improvement groups, crop of 1957.**
Agric. Mktg. Serv. Agric. Inform. Bull. 1958 : No. 186 : Pp. 84.

The results of tests on the principal commercial varieties constituting the 1957 crop in the USA are summarized along the lines of previous reports [XXVII, 4191].

4457 KHANA, R. C.
An experimental and statistical study in quantitative inheritance.
Statist. News Lett. 1957 : **7** : p. 17. (Abst.).

"Reference is made to a study of crosses of cotton strains at the Institute of Plant Industry, Indore. Selection has been practised for high and low staple length from F_3 onwards. Estimates of the heterosis and gene complex have been obtained. The amount of genetic variability present has been estimated. Conditions for selection to be most effective have been worked out. Estimates of components of phenotypic variation have been obtained and conditions under which these can be negative have been derived algebraically. The number of factors have been estimated by methods suggested by Panse in an earlier paper. The asymmetry in the response to selection has been studied extensively."

4458 NICHOLSON, G. E.
A note on Ethiopian cottons.
Emp. Cott. Gr. Rev. 1958 : **35** : 160–67.

This preliminary note is based on a collection made during the author's travels in Ethiopia, including Eritrea and Ethiopian Somaliland, between 1952 and 1957. Of the 36 collections grown at the Uganda Cotton Research Station, 20 represented *Gossypium hirsutum* var. *punctatum*; 2, *G. hirsutum* x *G. hirsutum* var.

punctatum; 10, *G. barbadense*, and 4, *G. herbaceum* var. *acerifolium*. No wild cottons were found, in spite of a fairly extensive search, especially for *G. somalense* in Eritrea. Information on the cottons grown in Ethiopia in the past and at the present time is discussed in relation to the possible routes of the dissemination of cultivated cottons in Africa.

4459 Logan, C.

Bacterial boll rot of cotton (*Xanthomonas malvacearum* (E. F. Smith) Dowson). I. A comparison of two inoculation techniques for the assessment of host resistance.

Ann. appl. Biol. 1958 : **46** : 230–42.

Using strains of Upland and Egyptian cotton, the following techniques were compared at the Cotton Research Station, Namulonge, Uganda: (1) application of the inoculum with a fine brush to the outside of the bolls immediately after corolla drop, and (2) inoculation into the wall tissue of bolls 3–4 weeks old with a needle. The second method has the following advantages: (*a*) it is simpler in practice, (*b*) more bolls per plant may be inoculated at one time, (*c*) those damaged by insect attack may be discarded, (*d*) bolls are inoculated at an age when they will not shed, (*e*) the lesion which develops is circular and thus more easily measured, and (*f*) no escapes have occurred. Brush inoculation is closely similar to natural infection and supplies the most satisfactory criterion of the end-result of lint damage. Choice of technique will therefore depend on the environmental conditions under which breeding is being carried out. Since resistance first appears to break down in the boll phase of infection, it is suggested that the ensuring of a high degree of boll resistance is the most promising method of securing resistance to stem and leaf infection, only testing of the bolls being necessary. It is further suggested that sufficient variability in resistance to boll infection exists within local strains for breeding purposes, without resorting to an extensive programme of hybridization to introduce new genes.

4460 Dadabaev, A.

(Breeding early varieties of fine-fibred cotton).

Hlopkovodstvo (Cott.-raising) 1958 : No. 4 : 39–41. [Russian].

Sowing cotton varieties and hybrids during the period 19 April–1 May gave rise to early forms in Uzbekistan. The effects of this method of training for earliness were intensified by selection and several fine-fibred varieties flowering and maturing appreciably earlier than such varieties as 10964, 5904I and 108F were developed. They included S8017, derived from a natural hybrid between 1–137 and 3169I. It outyields 10964 and 5904I, has a higher ginning percentage, is resistant to *Xanthomonas* and *Fusarium* and sheds its leaves naturally before harvesting.

4461 Desai, M. K.

Classification of some cotton strains according to their degree of resistance to wilt.

Indian Cott. Gr. Rev. 1958 : **12** : 88–91.

Under optimum conditions of infection under greenhouse conditions, strains of *Gossypium herbaceum* exhibited differences in the number of days elapsing before symptoms of *Fusarium* wilt appeared and in the number of days elapsing before all the plants were killed. Each strain was uniform in its reaction. A parallel is drawn between this type of response and the reaction of cabbage to *Fusarium* yellows, as reported by other investigators. Two types of resistance to the latter have been recognized: the monogenic type (A) which is not influenced by temperature or nutritional conditions, and the polygenic type (B), only expressed under favourable conditions. The cotton strain K Farm T14, which underwent no killing as the result of wilt infection, may be said to possess type-A resistance, whereas the reaction of a strain such as Jayawant, which displayed susceptibility after 20–40 days, resembles type B. Shan and Wagale, killed off after 16 days, behaved in a manner similar to cabbage varieties homozygous for susceptibility to *Fusarium* yellows.

4462 Venkata Ram, C. S.

Production of ultraviolet induced mutations in *Fusarium vasinfectum* with special reference to fusaric acid synthesis.

Proc. nat. Inst. Sci. India : Ser. B. : 1957 : **23** : 117–22.

Spores of *F. vasinfectum* irradiated with ultraviolet rays of 2536 Å for periods of up to 10 minutes gave rise to 23 cultural mutants, all of which remained stable through 10 successive generations. These cultural mutants, together with 7 apparently normal strains isolated from the irradiated material, were examined for changes in their fusaric acid production and pathogenicity. Six of the morphologically normal isolates showed a marked alteration in their fusaric acid synthesis and were therefore physiological mutants, while of the 23 cultural mutants six showed increased synthesis and 17 had lost their ability to synthesise fusaric acid. Six of these showed less than 50% postemergence infection of a susceptible cotton variety.

4463 Lakshminarayanan, K.
The physiology of host-parasite relationship in the *Fusarium* wilt of cotton. Part III. Distribution and derangement of free amino acids.
Proc. Indian Acad. Sci. 1958 : **47** : 115–23.

Further physiological differences have been found between resistant and susceptible varieties [cf. XXVII, 3225], cystine being found consistently in the resistant varieties. In susceptible varieties cystine was normally absent but appeared in infected roots six days after infection, disappearing the following day. The significance of these findings in relation to wilt resistance is discussed.

4464 Sizov, I. A.
(**The cultivation of flax in the USSR**).
Agrobiologija (Agrobiology) 1957 : No. 5 : 36–40. [Russian].

Mention is made of testing and investigation of phasic development of a collection of Soviet and introduced varieties at the Institute of Plant Industry. Some valuable breeding material has been selected. Most varieties showing improvements in yield and fibre quality have been obtained by hybridization. They include such standard varieties as Svetoč [Torch] from the Flax Institute, Prjadil'ščik [Weaver], originating from Pskov, Stahanovec, from Smolensk, and Vajžgantas from the Lithuanian Agricultural Institute.

4465 Rogaš, A. R.
(**The principal achievements in flax cultivation**).
Dokl. Vsesojuzn. Akad. seljskohozjajstv. Nauk Lenin (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 11 : 21–26. [Russian].

Ten recent standard varieties of flax originating from various Soviet institutes are mentioned. Though yielding well, they produce 35–40% less fibre than Pskov 1 and other new varieties which have reached an advanced trial stage.

4466 Bagge, H. & Larsen, A.
Forsøg med sorter af spindhør 1951–1956. (**Trials of varieties of fibre flax, 1951–1956**).
Tidsskr. Planteavl 1958 : **62** : 47–70.

The results of two sets of trials are reported. The first series took place at various stations in Denmark during 1951–54 and included six varieties; the Svalöf variety Kristina was the most generally satisfactory. In the second series, lasting from 1953 to 1956 and involving three varieties, the Netherlands variety Wiera equalled Kristina in quality and disease resistance and exceeded it in yield of flax and seed.

4467 Forsøg med sorter af spindhør 1955–1956. (**Trials of varieties of fibre flax, 1955–56**).
Tidsskr. Planteavl 1958 : **62** : 359–60.

Of one Swedish and five Netherlands varieties tested in Denmark, Wiera has yielded most.

4468 Durrant, A.
Environmental conditioning of flax.
Nature, Lond. 1958 : **181** : 928–29.

Experiments carried out on an inbred flax variety at the Department of Agricultural Botany, University College of Wales, Aberystwyth, have indicated that considerable increases in plant weight resulting from the application of combinations of N, P and K fertilizers to the parents may be maintained until the fourth generation after the parental treatment, the progenies being grown under a uniform set of fertilizer treatments [cf. XXVII, 4200]. The maintenance of these increases is probably due to cytoplasmic change. This suggestion is supported by evidence from other experiments, as follows. (1) Plants were grown from seed from capsules collected at varying stages of ripeness. Plant weight increased logarithmically with decrease in seed weight to the limit at which the seed was so small that no germination occurred. (2) Forty plants of two conditioned types which were reciprocally grafted retained their "identity" in both stock and scion. (3) Reciprocal crosses between two conditioned types resembled the ♀ parents more than the ♂, but evidence was also obtained of the transference of effect through the pollen in both directions. (4) The conditioned types did not produce the same relative dry weights when grown in the field in the summer as in a warm greenhouse under lower intensity of light and shorter day during winter. The following hypothesis is made. With relatively high temperature and low intensity of light, cell division proceeds rapidly, but the number of cytoplasmic self-duplicating particles falls, as the result of a shortage of photosynthetic products, the utilization of these products also being influenced by mineral supply. The altered cytoplasm stimulates the nucleus to synthesize different substances, or different amounts of the substances ordinarily produced, so that a new equilibrium between nucleus and cytoplasm is established. The new equilibrium may be at least as stable as the old, the plant group in question thus having the appearance and constancy of a distinct genotype.

4469 KROLOW, K.-D.
Über die selektive Wirkung verschiedener Kulturweisen auf eine heterogen zusammengesetzte Population des Leins. (**On the selective action of different cultural methods on a flax population of heterogeneous composition**).
Z. Pflanzenz. 1958 : **39** : 275–98.

Marokko [Morocco], an early flowering linseed with thin stems, low capsule and seed production and a high 1000-seed weight was crossed with a fibre variety, R.M.-Russe [R.M. Russian], the latter being a later type with longer and thicker stems, higher capsule and seed production and a relatively low 1000-seed weight. The following cultural procedures were used with F_3 and subsequent generations: thick sowing, early harvest; thick sowing, late harvest; thin sowing, early harvest; and thin sowing, late harvest; an early harvest was taken when the capsules were just beginning to turn brown and a late harvest when they were fully ripe, while thin sowing corresponded to 60 or 80 seeds per row and thick to 400 or 800. Progeny from each of the four populations were grown under the same conditions as those of the parents for seven years, before individual progeny testing was undertaken, after which similar experiments were continued, starting with a mixture of seed originating from the four populations.

After 11 years, tests of individual plants showed that differences were present between the four populations in certain characters. The effect of selection had been greatest for the thickly sown populations. Degeneration was observed in the populations with high seed rate and early harvest, and shortening of the main stem, reduction of stem thickness, and low seed production were observed together with earlinesss in flowering. On the other hand a high seed rate combined with late harvest favoured the development of good fibre types; plants superior to the F_1 in stem length and seed yield and having a high 1000-seed weight were found in this population. For both seed rates, the earlier harvests produced populations with higher 1000-seed weights but in the thinly sown populations the values did not reach those of the higher seed-rate progeny. Only slight differences were noticed in the selective action of early and late harvest in the thinly sown populations and in both cases the populations tended to resemble the Russian parent.

With respect to the time of flowering, it was found that the selection process was practically finished after seven years, no important changes occurring after that time.

Observations were made on the survival rate of the different genotypes in the four populations; in this respect early flowering, low seed-producers were superior to late-flowering types with high seed production in the thickly sown populations; such differences were not observed with the lower seed rate. In the former case, an early harvest favoured seed production of the early types but with late harvesting, the late-flowering types produced more seed; with thin sowing, the latter produced most seed for both harvesting dates. It is recommended that, when cultivating fibre types for seed production, plants be left until the fruits are completely ripe in order to prevent the occurrence of selection for undesirable early types.

4470 ROGAŠ, A. R.
(**The progress of breeding work with flax in the Soviet Union**).
Lën i Konoplja (Flax & Hemp) 1957 : No. 10 : 8–14. [Russian].

Descriptions are given of ten recent standards, all of which are more productive of seed and fibre than the earlier varieties. Among them Svetoč [Torch] and 806_3 are distinguished by high quality of fibre, 17 by resistance to *Fusarium* and 1288_{12}, 19 and especially L1120 (B130/2 x A2176) by resistance to lodging. Želtosemjannyj [Yellow-seeded], a-811 and b-186 were obtained by selection, the first from Švetoč and the other two from northern land races. Severjanin [Northern], I16, T5 and Pskov 1 are hybrids between geographically distant forms. T7 and T9 are multiple hybrids and VNIIL1 [Flax Institute 1] is a vegetative hybrid between Tekstil'ščik [Textile worker] and a perennial *Linum* species; the last-mentioned hybrid is resistant to *Melampsora*.

4471 KONDAKOV, N. A. & KONDAKOVA, O. A.
(**The new flax variety T5**).
Lën i Konoplja (Flax & Hemp) 1957 : No. 12 : 22–24. [Russian].

An account of flax breeding at Tomsk, together with a description of T5 (V1143 x I2), is given. It is more productive of seed and fibre than the standard 1288_{12} and surpasses the latter in resistance to lodging. The new varieties T4, from the same cross as T5, and T7 and T9, both from (1288_{12} x I5) x (V1143 x I2), possess similar properties to T5.

4472 VINOGRADOV, A.
(Flax).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 2 : 71–74. [Russian].

Mention is made of north Russian land races which have provided valuable breeding material and of a few varieties with improved fibre yields obtained from these by selection or hybridization. These include 1288/12, Prjadil'ščik [Weaver], Stahanovec and Svetoč [Torch], which have a fibre content of 26–28%.

4473 KISS, E.
Untersuchung der Anfälligkeit von Leinsorten für *Colletotrichum lini* (West) Toch. bei künstlicher Infektion. [**Investigation on the susceptibility of flax varieties to *C. lini* (West) Toch. under artificial infection**].
Acta Agron., Budapest 1958 : **7** : 413–27.

An improvement in resistance was effected in 46 varieties during 1954–56 by frequent spraying of the plants with a spore suspension and subsequent selection of seed from the most resistant plants for sowing in the following year. On the basis of the results obtained, the varieties regarded as most promising as parents in further breeding are Bernburger Faserlein [Bernburg fibre flax] and Sumperker Kompromisslein [Sumperk Dual-purpose flax], both used as dual-purpose varieties in Hungary, the linseed types K39(A) and 3030 La Estanzuela and the fibre flaxes Concurrent and Margareta. Correlations between resistance on the one hand and maturity period and 1000-seed weight on the other were — 0·3039 ± 0·1341 and — 0·3707 ± 0·1274 respectively.

4474 CRESCINI, F. & CHIARUGI, A.
Azioni mutagene e ricombinatorie di tipo Mendeliano della fecondazione incestuosa nella canapa (*Cannabis sativa* L.). [**Mutagenic action and recombination of a Mendelian type in the inbreeding of hemp (*C. sativa* L.)**].
RC Accad. Lincei : Ser. 8 : 1958 : **24** : 167–70.

Some of the genes previously reported [XXVII, 3238] have been shown to segregate in a normal Mendelian manner.

4475 **(Towards new successes in hemp growing).**
Lën i Konoplja (Flax & Hemp) 1957 : No. 11 : 14–18. [Russian].

Mention is made of two new monecious varieties, one of the central Russian type and the other of the southern type. The former is 18 days earlier than JuS1, a standard in the Sumy province, and produces 35% more seed but yields 9% less fibre. The other equals the standard Krasnodar in seed yield and ripens 10 days earlier, but produces 25% less fibre.

4476 NIKIFOROV, I. L.
(Monecious hemp occurring as a weed in Azerbaijan).
Priroda (Nature), Leningrad 1958 : No. 3 : 98–99. [Russian].

Mention is made of wild forms of breeding interest which occur in Azerbaijan, in particular monecious large-seeded forms from the Kusary and Kuba districts. They bear ♀ flowers principally, are more productive of stems and seed than most varieties of the southern type and their technological properties are good. The Kuba form has already been used successfully for breeding monecious varieties at Gluhov.

4477 RUDNEV, V. N.
(Wild hemp—initial material for breeding).
Lën i Konoplja (Flax & Hemp) 1957 : No. 10 : 47–48. [Russian].

Wild hemp from Baškiria included forms resistant to pests and diseases and with shorter growth periods and higher seed and fibre yields than the local cultivars. Some hybrids between the wild and cultivated forms gave an F_1 with 18–22% higher seed and 38–43% higher fibre yield than the parents.

4478 CHENG, C.-C.
(The breeding of new jute varieties and their usefulness in industry).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 409–23. [Chinese].

Work on jute selection in the province of Chekiang and the results of local trials are reported. The following four selections are recommended. Hsin-feng [New Luxuriant], a selection of the Taiwan variety Hsin-feng-ching-pi [New Luxuriant Green-skinned], is a late variety resistant to drought. Chi-kou was selected from material originating in Fukien; it is a late variety that has remained relatively free from disease. Pei-lien-chih, selected from Taiwan material, is a productive late variety, resistant to *Colletotrichum corchorum* but not to drought. Tsui-lu [Green], a selection from the Indian variety Chinsurah Green, is a productive late variety, resistant to drought and diseases.

4479 Basak, S. L.
Variations in the haploid chromosome number of *Corchorus sidoides* F. Muell (family: Tiliaceae).
Curr. Sci. 1958 : **27** : p. 101.

Haploid numbers of 6 and 8 were found in the above species, in addition to the normal number of $n = 7$.

4480 Datta, R. M.
Comparative studies on the genesis of sperms in the pollen tubes of two cultivated jute species.
Cellule 1957 : **58** : 287–304.

Observations of pollen grain germination in *Corchorus olitorius* and *C. capsularis* showed that (1) the pollen grain is binucleate at the time of anther dehiscence, (2) the tube nucleus generally precedes the generative nucleus, (3) the chromosomes of the latter divide equationally with clear spindle formation and (4) cytocinesis occurs by the formation of constriction furrows, the cells thus formed eventually contracting to form two elliptical sperms.

4481 Sanyal, P.
Embryological investigation in *Hibiscus sabdariffa* x *H. cannabinus* and their reciprocal crosses.
Nature, Lond. 1958 : **181** : p. 1352.

Examination of the above crosses at the Jute Agricultural Research Institute, Barrackpore, India, demonstrated that a normal type of porogamous fertilization took place. The seed sterility of this combination is probably due to some kind of somatoplastic sterility.

4482 Nevinnyh, V. I.
(The kenaf variety Kuban' 333).
Lën i Konoplja (Flax & Hemp) 1957 : No. 12 : p. 25. [Russian].

The variety was bred from two very early forms in the North Caucasus. It is more productive of fibre than 21 and 3876, the standard varieties for the area, and shows improved resistance to *Botrytis*. It has stems 3·5–4·5 m. long and a habit suitable for combine harvesting.

4483 Summers, T. E., Pate, J. B. & Wilson, F. D.
Extent of susceptibility within kenaf, *Hibiscus cannabinus* L., to root-knot nematodes.
Plant Dis. Reptr. 1958 : **42** : 591–95.

All the 89 varieties, introductions and selections tested in Florida were susceptible to *Meloidogyne incognita* and *M. incognita* var. *acrita*. Individual-plant selection has however led to a reduction in susceptibility in comparison with the parent varieties and lines.

SUGAR AND STARCH PLANTS

4484 Lakshmikantham, M. & Prasada Rao, K. K.
Studies in parental influence on sugar-cane varieties tested at Anakapalle. Proc. 25th Annu. Convent. Tech. Sug. Ass. India 1957 : Pt. 1 : 1–20.

The influence of parentage on the performance of seedlings tested at the Sugarcane Research Station, Anakapalle, during the past 20 years was studied with reference to germination, number of stalks per acre, cane yield per acre and sucrose percentage. Judged by the number of seedlings satisfactory in all or some of these respects, the combinations Co.464 x Co.453 and Co. 464 x Co.301 were the most valuable. As ♀ parents, POJ2878, Co.464 and Co.449 were outstandingly good. As ♂ parents, Co.214, Co.449, Co.349 x Uba Marot, Co.371 and POJ2725 x *Imperata* sp. imparted the character of high sucrose percentage to their progeny.

Annual Report of the Mauritius Sugar Industry Research Institute 1957 : Pp. 100 + 24 appendices.

4485 *Introduction.* (*pp. 9–28*).

A table is included showing the important characteristics of the nine major commercial varieties cultivated in 1957.

4486 *Sornay, A. de. Cane breeding.* (*pp. 29–40*).

The percentage arrowing of a number of varieties is tabulated and the crosses made and selection carried out during the season are briefly discussed. Two curious forms, thought to be reversions to the ancestral Chunnee type, have been selected from the progeny of B37161 x Ebène 1/37 and M241/40 x POJ3016. In the prerelease variety trials M147/44 and M31/45 have done particularly well in the warm irrigated regions of the western part of the island. Comments are made on the performance of several other varieties in these trials.

4487 *Halais, P. & Rouillard, G. Cultivation. 1. Highlights of post-release variety trials.* (*pp. 77–79*).

The characteristics of six varieties are briefly mentioned.

Memoria de la XXX Conferencia Anual. Asociación de Técnicos Azucareros de Cuba. (**Report of the 30th Annual Conference of the Association of Sugar Technologists of Cuba**).
La Habana 1956 : Pp. 556.

4488 *Barreto Domínguez, R. Resultados obtenidos en los estudios comparativos de variedades realizados por la Estación Experimental de la Caña de Azúcar de Jovellanos en la zafra de 1956.* (*Results obtained in the comparative studies of varieties carried out by the Jovellanos Sugar-cane Experimental Station in the 1956 crop*). (*pp. 1–15*).

In the third part of this report [cf. XXVII, 2041] it is shown that cane C540–47 was significantly better than most others in yield in the second ratoon crop, having given 15% more sugar per unit area than Co.281 and 5% more than POJ2878 in some trials. Other varieties that have given promising results in the first and second ratoon are BB7–161, C693–47 and C676–47.

4489 Skinner, J. C.
Sugar cane selection experiments. 1. Bunch planting.
Tech. Commun. Bur. Sug. Exp. Sta. Qd. 1957 : No. 1 : Pp. 29.

Bunch-planted seedlings of the polycross of Trojan with the ♂ parents Co.281, POJ2878, Eros, Q36, Pompey, POJ2940, Comus and G270 were selected in three classes, designated best, medium and worst. A random class was also obtained from unselected, single-planted seedlings of the same cross. The genetical value of each class was then estimated by growing the selected seedlings in 2-sett plots. Selection from the bunch planting was very effective, as shown by significant differences in stalk length, thickness, Brix and other characters between the three classes. The best class yielded four times as many selections as the random class in the 2-sett plots. Good condition of the tops, a character closely associated with freedom from arrowing, had a very high selection differential in both the bunch planting and 2-sett plots. It possessed relatively high heritability and was positively correlated with Brix, and stalk length and thickness in the 2-sett plots, although independent of stooling. Seedlings with poor tops in the bunch planting yielded no selections in the 2-sett plots. Selection for Brix and stooling may be left until the stage of the 2-sett plots. It is concluded that bunch planting shows promise as a method of selection under conditions in Queensland. More widely based experimental data are however necessary for deciding whether or not bunch planting should replace single planting as the standard technique. Bunch planting also provides a means of selecting flowering varieties for use in hybridization and for this purpose it has now been substituted for single planting.

4490 Weitzman [Witsman], L. & Gutstein, I. [Gutstin, Y.].
(Testing sugar-cane varieties).
Sadeh (Field)/Hassadeh 1956 : **36** : 629–31. [Hebrew].

The results of trials of varieties, most of them introduced from abroad, are given. Co.419 and EPC33–201 produced most cane; CP44–101 gave the highest sugar percentage.

4491 Moriya, A.
Contributions to the cytology of the genus *Saccharum*. VI. Chromosome number of *Saccharum spontaneum* in Japan Islands.
Cytologia, Tokyo 1956 : **21** : 188–91.

Clones of *S. spontaneum* collected in Japan proper had $2n = 112$. In a clone from Amami Oshima Island, the chromosome number was $2n = 104$ while a clone from Okiawa Island had $2n = 112$. The author's hypothesis that Japanese and Formosan varieties of *S. spontaneum* may have an independent distribution from Java is confirmed by a comparison of morphological characters. [Cf. XXII, 2016].

4492 Hayot, H.
Évolution de la richesse de différentes variétés en fonction du temps à Rivière-Salée et à Sainte-Marie. (**Development of the richness in sugar of different varieties as a function of time at Rivière-Salée and at Sainte-Marie**).
Rev. agric. sucr. rhum. Antilles franç. 1958 : **3** : 39–48.

Graphs are presented showing how the sugar yields of several cane varieties grown in the above districts varied according to the dates of harvesting.

4493 Stehlé, H.
Corrélation entre la floraison de la canne, la dureté de la tige, la résistance au vent et l'attaque par les borers. (**Correlation between flowering of sugar cane, hardness of the stem, resistance to wind and attack by borers**).
Rev. agric. sucr. rhum. Antilles franç. 1958 : **3** : 31–38.

Data are presented showing that arrowed canes suffer more from attack by borers than non-arrowed canes and this may be related to the greater hardness of the stems of the latter. The hardness of the rind is a varietal character which helps to determine wind resistance; environmental conditions may cause intra-varietal differences in this character. [cf. 1909].

4494 Cikov, D.
(Sugar sorghum).
Kooper. Zemed. (Cooper. Fmg.), Sofija 1958 : No. 1 : 18–19. [Bulgarian].

The new varieties 54 and 71, from the Bulgarian Institute of Plant Industry, are mentioned for good forage yields and a high sugar content.

4495 Coleman, O. H. & Stokes, I. E.
The inheritance of weak stalk in sorgo.
Agron. J. 1958 : **50** : 120–21.

In the cross Sart x Iceberg the erectness of the former variety behaved as a simple dominant (*EE*) to the stalk weakness of the latter (*ee*). *Ee* was independent of *Ll* for resistance *vs.* susceptibility to anthracnose and *Lsls* for resistance *vs.* susceptibility to stalk red rot, both these diseases being caused by *Colletotrichum graminicolum.*

4496 Žák, V.
Príspěvek k problematice odrůdových pokusů s cukrovkou. **(A contribution to the problem of varietal trials of sugar beet).**
Listy cukr. 1957 : **73** : 265–73.

On the basis of analysis of varietal trials carried out in 1955–6, the following improvements in design were proposed: use of smaller plots to allow for the effect of soil heterogeneity; use of the mean of all the tested varieties instead of a standard variety; increase in the number of replications; and rejection of plots showing extreme deviations in the figure for root yield.

4497 Zana, J.
A (k + 1) típusú 5 x 5-ös rácsnégyzet alkalmazása cukorrépa fajtakísérleteknél. **[The use of the (k + 1) 5 x 5 type of lattice square in sugar-beet variety trials].**
Növénytermelés 1957 : **6** : 119–30.

The design and evaluation of trials of the above type are described and exemplified by a trial of 25 sugar-beet varieties. The efficiency of the 5×5 ($k + 1$) lattice square design was more than double that obtainable with the randomized block layout.

Berichte über Sortenversuche mit Zuckerrüben. **(Reports on variety trials with sugar beet).**
Arb. dtsch. Landw.-Gesell. 1958 : **49** : Pp. 83.

4498 *Lüdecke, H. & Müller, A. v. Sortenversuche mit Zuckerrüben im Bundesgebiet 1953–1956 (zusammenfassende Auswertung). [Variety trials with sugar beet in the Federal Region, 1953–56 (a collective evaluation)]. (pp. 7–66).*

After describing the organization of sugar-beet variety trials held in Federal Germany during 1953–56, the results obtained from various stations are collected together and presented in tabular form. Information is given on yield of roots and foliage, percentage of dry matter in roots and foliage, polarization value, sugar yield and the percentage of early and late bolters of a series of varieties. Some theoretical questions in connexion with variety trials are discussed. For example, the possibilities of decreasing the total size of the experimental area when the results of many years are to be evaluated together are considered; a decision on this point depends on how many trials are to be carried out.

4499 *Huber, J. Weitere Sortenversuche mit Zuckerrüben im Rheinland 1950–1956. (Further variety trials with sugar beets in the Rhineland, 1950–56). (pp. 67–83).*

The results are reported of trials held in various parts of the Rhineland, information being given on the yield of roots, foliage and sugar, and resistance to bolting of a series of varieties. Investigations were carried out to determine the time of ripening of E and N types and Polybeta. At the beginning of the harvesting period, the N type was slightly superior in respect of sugar yield but in later months it did not show the same increase in sugar as the E type. Polybeta continued to increase its sugar content in the autumn, and was found sometimes to surpass the E type in this respect earlier in the year.

4500 Buzanov, I. F.
(Unity of theory and practice in Soviet beet-growing).
Dokl. Vsesojuzn. Akad. sel'skohozjajstv. Nauk Lenin (Proc. All-Un. Lenin Acad. agric. Sci.) 1957 : No. 11 : 13–20. [Russian].

This review of sugar-beet breeding at various Soviet institutes mentions recent standard varieties which have a 0·2–0·3% higher sugar content than older varieties and yield 2–3 c.

more sugar per ha. Other new varieties are nonbolters, show resistance to *Cercospora*, respond with improved yield to increased moisture or have monogerm seed balls.

4501 ORLOVSKIJ, N. I.
(Breeding sugar beet in the USSR in its present stage).
Sahar. Svekla (Sug. Beet) 1957 : No. 11 : 12–17. [Russian].

[Cf. 1939].

4502 SEMPOLOVSKIJ, L. D.
(Breeding—this is persistent work).
Sahar. Svekla (Sug. Beet) 1957 : No. 11 : 23–25. [Russian].

An historical account of breeding work with sugar beet at the Uladovo-Ljulincy Breeding Station, the oldest of its kind in the USSR, having been founded in 1888, is given. Mention is made of some varieties said to be still unsurpassed in yield and other economic characteristics by new varieties bred at other institutes.

4503 OLTEANU, G. & MUMJIEVA, E.
Contribuţii la crearea de soiuri de sfeclă de zahăr şi producerea seminţei elite. **(Contributions to the breeding of sugar-beet varieties and the production of élite seed).**
Lucr. Inst. Cerc. aliment. 1958 : 2 : 331–39.

Trials of introduced and local varieties and of lines selected from them in Rumania are reported. Four lines, Roman 478 [Rumanian 478], Roman 236, Bod 165 and Bod 177, all selections from Buszczynski CLR, are regarded as especially promising in respect of yield and resistance to drought and *Cercospora*.

4504 **Two year sugar-beet cultivation experiment in Taiwan.**
Taiwan Sug. 1957 : **4** : No. 12 : 18–21.

Tabulated data are provided on yield of roots and sugar from a series of varieties tested in several localities in Taiwan during 1955 to 1957.

4505 GUTTSTEIN, I. [GUTSTIN, Y.] & WEITZMAN [WITSMAN], L.
(Comparing a polyploid sugar-beet variety with ordinary varieties).
Sadeh (Field)/Hassadeh 1956 : **37** :12–13. [Hebrew].

In a comparative trial in Israel involving the polyploid Eagle Hill 8321 Poly and a series of standard diploid varieties, the former gave the highest sugar percentage.

4506 **Kleinwanzlebener Multa N.**
Dtsch. Landw., Berl. 1958 : **9** : p. 153.

This polyploid sugar beet is mostly triploid but diploids and tetraploids also occur. A high yield of roots is combined with a good polarization value and the yield of sugar surpasses that of Kleinwanzleben 2; there is also high resistance to bolting and a satisfactory production of foliage.

4507 **Kleinwanzlebener Verna.**
Dtsch. Landw., Berl. 1958 : **9** : p. 153.

This sugar beet is resistant to bolting and comparable to Kleinwanzleben N in respect of the form of the root and the sugar content. It tolerates an early sowing date and under such conditions gives a high yield of sugar and foliage.

4508 MAZLUMOV, A. L.
(Varieties from the Ramon' Station).
Sahar. Svekla (Sug. Beet) 1957 : No. 11 : 17–22. [Russian].

Mention is made of sugar-beet varieties bred at the above breeding station. Some of these, including the recently developed R023, are suitable for square planting and highly productive of sugar per unit area. R1537, an older variety with high quality roots low in nitrogen, has yielded up to 1515 c. roots per ha. on irrigated land in Kazahstan.

4509 MARGARA, J. & TOUVIN, H.
La polyploïdie chez la betterave sucrière. **(Polyploidy in sugar beet).**
CR Acad. Agric. Fr. 1958 : **44** : 172–76.

The results are reported of trials held at Versailles during 1953–56 with three diploid varieties of sugar beet of the N type and their corresponding tetraploid forms. The polyploids were not superior to the diploids in every year, although the average yield of roots and sugar for the four years was greater in the polyploids than in the corresponding diploids. Triploids produced by crossing male-sterile diploids with tetraploids appeared superior to both parents in yielding capacity of roots and sugar; heterosis seemed to be responsible for increased cell division in these forms. Tetraploids obtained by colchicine treatment of diploids showed increase in size of various organs such as pollen and leaves. The findings of Mochizuki and Sueoka [cf. XXVII, 2075] with regard to the number of chloroplasts in the guard cells of $2n$, $3n$ and $4n$ forms were confirmed.

4510 DUDLEY, J. W.
Number of chloroplasts in the guard cells of inbred lines of tetraploid and diploid sugar beets.
Agron. J. 1958 : **50** : 169–70.

The mean number of chloroplasts per guard cell was 11·8 ± 0·11 in the tetraploids and

6·6 ± 0·11 in the diploids. A method of screening large numbers of plants for colchicine-induced tetraploidy by means of counts of the chloroplasts in the guard cells is outlined.

4511 Mándy, Gy. & Pál, Gy.
Polyploid cukorrépák vízgazdálkodási vizsgálata I. (**Investigation on the water economy of polyploid sugar beets I**).
Növénytermelés 1957 : **6** : 135–44.

In studies of corresponding leaves of diploid, triploid and tetraploid plants, osmotic pressure varied during the day and during the course of the vegetative period and was affected by drying and other treatments. The values were consistently higher in the diploid than in the polyploids, the lowest values generally occurring in the tetraploid.

4512 Ustimenko, S. P.
(**The effect of the pericarp upon the germination rate of monogerm sugar-beet seed**).
Sahar. Svekla (Sug. Beet) 1957 : No. 12 : 24–27. [Russian].

In studies at Belaja Cerkov', a high 1000-seed weight was associated with a slow germination rate. Mechanical removal of the pericarp improved the germination rate and also increased root yields and sugar content. Breeding monogerm sugar beet for large seed and for reduced proportion of pericarp is urged.

4513 Orlovskij, N. I., Kolomiec, O. K. & Popov, A. V.
(**Monogerm sugar beet**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 65–74. [Russian].

An account of Soviet research with monogerm sugar beet, together with the results of the 1956 trials of the varieties from Belaja Cerkov' and the Jaltuškov Breeding Centre, is presented. BC56–104 from the first named institute yielded more roots and sugar per unit area than U752 and R06, and Ja56–555 from the other institute more roots and sugar than Ja02 and R06.

4514 Zosimovič, V. P.
(**Outstanding achievements in Soviet breeding**).
Sahar. Svekla (Sug. Beet) 1957 : No. 10 : 11–17. [Russian].

An account of breeding monogerm sugar-beet varieties at various Soviet institutes is given. Mention is made of recent trials of Belocerkovskaja Odnosemennaja [Monogerm Belaja Cerkov'] which is as productive as ordinary varieties.

4515 **Monogerm finds its place.**
Utah & Ida. Cult. 1958 : **18** : 2–3.

After giving satisfactory yields and an average saving of 28% in labour requirements in 1957, monogerm hybrid sugar beet developed as the result of cooperative work between the US Department of Agriculture and the Utah-Idaho Sugar Company is to be planted on 60,000 acres in 1958. The monogerm hybrids compare favourably with standard multigerm varieties in sugar content.

4516 Vukov, K.
Az újabb magyar cukorrépafajták feldolgozhatósága. (**The processing quality of recent Hungarian sugar beet varieties**).
Növénytermelés 1957 : **6** : 155–64.

Comparative data are presented on the chemical and physical properties of the hybrid Beta K91, the polyploid Beta Poly 1 and Buszczynski CLR. The last variety has a high sugar content and low ash content, while Beta K91, although lower in sugar content, yields more sugar per unit area; Beta Poly 1 combines high sugar with high yield. In other characters the varieties did not differ significantly.

4517 Shepherd, A.
Experimental methods in testing for resistance to beet eelworm, *Heterodera schachtii* Schmidt.
Nematologica, Leiden 1958 : **3** : 127–35.

Methods of testing for resistance to *H. schachtii* were compared; these involved adding either cysts or hatched larvae to pots containing beet seedlings or filling the pots with a mixture of infested soil and compost. Later the number of cysts on the peripheral root system was counted and the total number of cysts per pot was estimated. It was found that: (1) the range of cyst counts was very large in each experiment; (2) more cysts developed per plant under summer conditions than under winter conditions; (3) a higher rate in inoculation did not cause an increase in the number of cysts developed; (4) the coefficients of variation of the counts of cysts on peripheral roots were very high and (5) differences between coefficients of variation for total cyst counts were not significant. A count of cysts on peripheral roots will therefore not detect small differences in the number of cysts supported by various plants unless a high rate of replication is used.

A technique for large-scale testing under greenhouse conditions is described, the seedlings being grown in pots to which larvae at the rate of 20 per g. of soil are added. Using the technique described, inbred lines of sugar beet and crosses between sugar beet and *Beta maritima* were tested; further progeny testing is necessary to determine whether any of the selections have true resistance.

4518 Coons, G. H., Stewart, D., Bockstahler, H. W. & Schneider, C. L.
Incidence of savoy in relation to the variety of sugar beets and to the proximity of wintering habitat of the vector, *Piesma cinerea*.
Plant Dis. Reptr. 1958 : **42** : 502–11.

At Pandora, Ohio, the variety US215 x 216 suffered significantly less from savoy virus disease than eight other varieties; accession 1360, a hybrid of US104 and US400, was the most resistant of eight varieties tested in Minnesota.

4519 Björling, K.
Incidence of beet yellows virus in weeds in Sweden and some notes on differential hosts for strains of the virus.
Ann. Acad. reg. Sci. upsal. 1958 : **2** : 17–32.

Investigations on the host range of the beet yellows virus have shown that *Claytonia perfoliata* is a host and may be used to differentiate between strains intermediate in virulence. No evidence of permanent changes in virulence of strains after passage through different host species was found. Mild, intermediate and severe strains were identified in spinach and 4 of the 42 different weed species analysed.

4520 Kriebel, H. B.
Some analytical techniques for tree race studies.
Proc. Soc. Amer. For. 1956 (1957) : 79–82.

With special reference to the distribution of sugar maple in the USA, the uses of various statistical techniques for analysing continuous and discontinuous geographic variation of various characters and its relation to latitude and temperature are outlined [cf. 3246].

4521 **More wild yams collected.**
Agric. Res., Wash. 1958 : **6** : No. 8 : 15–16.

A note on a collection of wild *Dioscorea* spp. recently made in Mexico, Costa Rica and Guatemala by the US Department of Agriculture with a view to the production of sapogenins reports that forms with a diosgenin content above the average and others containing gentrogenin and corellogenin have been found. The collection is under investigation by breeders.

STIMULANTS

4522 Endemann, W.
Zur Sortenfrage beim Tabak. (**Variety questions in tobacco**).
Ber. Inst. Tabakforsch. Dresden 1956 : **3** : 19–41.

Variety trials in Eastern Germany during 1951–54 are reported. Two cigarette tobaccos are recommended: B55, designated Wohlsdorfer Burley after release, which is resistant to brown-vein virus and leaf-spot diseases, develops rapidly and uniformly, and has better quality than Virginia Gold A; and D23, a high-yielding disease-resistant line with a low nicotine content. No cigar varieties superior to Havana Lc or Geudertheimer III were noted.

4523 Ioan, E. & Săndulescu, R.
Producerea seminţei elite la tutun. (**Production of élite tobacco seed**).
Lucr. Inst. Cerc. aliment. 1958 : **2** : 291–306.

Yield increases of 3·3–12·5% are reported from the progeny of élite seed produced from intercrossing lines of the same variety grown in different environments as compared with plants raised from seed not produced by intravarietal hybridization.

4524 Ioan, E. & Ille, C.
Efectul heterosis in a doua generatie la tutunurile orientale. (**The effect of heterosis in second generation hybrids of oriental tobaccos**).
Lucr. Inst. Cerc. aliment. 1958 : **2** : 319–30.

The performance of a series of Rumanian tobaccos was compared with that of some of their F_2 hybrids and one F_1 hybrid. Heterosis in respect of yield and quality was evident in all the F_2 hybrids, and Drăgăşani x Yaka Xanthy [Xánthe Foot-hills] and Peruştiţa x Plovdiv 240 are recommended for further trial. In the cross Sari d'Almyros [Almyros Yellow] x Peruştiţa, the F_2 was more productive than the F_1.

4525 Shimoyama, K.
(**Cytogenetical studies in *Nicotiana*. XI. Meiosis in two interspecific hybrids**).
Senshokutai (Chromosome)/Kromosomo 1957 : **32** : 1095–100. [Japanese].

This is a fuller version of an article already summarized [XXVII, 3820].

4526 SAND, S. A.
Phenotypic variability and the influence of temperature on somatic instability in cultures derived from hybrids between *Nicotiana langsdorffii* and *N. sanderae*.
Genetics 1957 : **42** : 685–703.

A detailed account is given of investigations already briefly reported [XXVII, 2083].

4527 CHAWKAT, J.
La culture du tabac en Syrie. (**Tobacco cultivation in Syria**).
Rev. int. Tabacs 1958 : **33** : 27–30.

Brief descriptions are provided of four tobacco varieties cultivated in Syria.

4528 JALIHAL, K. A. & KRISHNA RAO, M. S.
S. 20–2 : an improved *bidi* tobacco variety for the Nipani tract.
Mysore agric. J. 1957 : **32** : 142–44.

Developed at the Agricultural Research Station, Nipani, Mysore, the above selection has surpassed the local type in yield by 15–30% and in quality. S20–2 has the desired character of highly spangled leaves.

4529 DEJMONTOVIČ, B. I.
(The new cigar-tobacco variety Pogarskij and the work on improving it).
Agrobiologija (Agrobiology) 1957 : No. 6 : 135–38. [Russian].

The yield, size and quality of leaves of this variety have been improved by selection at the Starodub Research Station, Brjansk province.

4530 BUROV, I. I.
(Raising tobacco production in the Uzbek SSR).
Tabak (Tobacco) 1958 : No. 1 : 46–48. [Russian].

Trebizond 161, Trebizond 1272, Ostrolist 2747 [Narrow-leaf 2747], Samsun 4–28 and Dubec 7 were bred at the Tobacco Institute or its branches. All of them are grown in the Urgut district in the province of Samarkand where they are valued for high yield and high quality leaf.

4531 SCARASCIA, G. T.
Anomalie in piante di *Nicotiana tabacum* L. derivate da semi trattati con neutroni termici. (**Anomalies in plants of *N. tabacum* L. derived from seeds treated with thermal neutrons**).
Nuovo G. bot. ital. 1957 : **64** : 137–44.

The following were among the anomalies observed in plants grown from neutron-irradiated seed: irregularities in mitosis in the root tips, growth retardation, dwarfing, axillary-bud development, anomalies in shoot and flower morphology, reduced yield and sterility.

4532 SAKAI, K.-I.
Studies on competition in plants. VI. Competition between autotetraploids and their diploid prototypes in *Nicotiana tabacum* L.
Cytologia, Tokyo 1956 : **21** : 153–56.

From data on the top weight, plant height, numbers of leaves and flowers and flowering date of White Burley or Bright Yellow planted as pure stands of $2n$ and $4n$ individuals and as mixtures of these two forms, it was concluded that, as in the case of barley [cf. XXV, 1983], doubling of the chromosome number decreased competitive ability in tobacco [cf. XXVII, 3834].

4533 MURAOKA, Y. & OHORI, K.
(The developmental response of tobacco under constant and varying temperature conditions).
Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 139–40. [Japanese].

Differences between the vegetative cycles of the varieties Bright Yellow, Oxford 25 and Xánthe when grown under 8, 14 and 24 hr. photoperiods and at either a constant temperature or alternating warm and cold temperatures are reported.

4534 ANIŢIA, N. & ILLE, C.
Variaţia caracterelor morfologice şi biochimice la tutun sub influenţa mediului. (**Variation in morphological and biochemical characters in tobacco under the influence of the environment**).
Lucr. Inst. Cerc. aliment. 1958 : **2** : 317–18.

Twenty varieties were grown in seven Rumanian localities and from a study of their differential behaviour in the various environments the relative role of heredity and environment in the determination of size of organs, number of leaves and content of nicotine, protein, resin and carbohydrates was ascertained.

4535 BOLSUNOV, I.
L'origine, les caractéristiques et les problèmes d'amélioration des différentes variétés de tabac du type "Burley". (**The origin, characteristics and problems of improvement of different varieties of tobacco of the Burley type**).
Rev. int. Tabacs 1957 : **32** : 155–57; 219–23.

A brief account is presented of the spread of Burley type tobacco since the original White Burley mutation was discovered in Ohio in 1864.

Burley tobacco is characterized by its low production of chlorophyll and the rapid decomposition of the chlorophyll in the leaves after harvesting; both characters are controlled by two closely linked recessive genes. Mention is made of the occurrence of these characters in other types of *Nicotiana tabacum* and *N. rustica*. Improvement of Burley tobacco involves selection for increased vigour, hardiness and resistance to disease; experimental stations interested in this work are listed. The quality of different types of Burley tobacco is mentioned; in this connexion, it is pointed out that many of the European Burley varieties have quite different flavours from the original American Burley tobaccos.

4536 Latuszynski, G.
La culture du tabac à cigarettes (*Nicotiana tabacum*) à faible teneur en nicotine. **[The cultivation of cigarette tobacco (*N. tabacum*) with low nicotine content].**
Rev. int. Tabacs 1958 : **33** : 51–58.

At Puławy in Poland, crosses were made between Virginia Gold and a Polish variety, Multan 27, originating from *Nicotiana fructicosa* x *N. macrophylla* x *N. havanensis*. Lines were isolated showing resistance to *Thielaviopsis basicola* and having a particularly low nicotine content; for example no nicotine was found in line 1121 growing on a well fertilized soil, and on a siliceous soil the nicotine constituted only 0·03% of the dry matter. Three of the lines mentioned outyielded the standard Virginia Joyner in a three-year trial. A detailed morphological description is provided of line 1121, which is vigorous, early and gives a satisfactory yield of light tobacco.

4537 Drolsom, P. N. & Moore, E. L.
Reproduction of *Meloidogyne* spp. in flue-cured tobacco lines of root-knot resistant parentage.
Plant Dis. Reptr. 1958 : **42** : 596–98.

Observations on egg-mass formation indicated that the 13 flue-cured breeding lines tested in North Carolina were highly resistant to *M. incognita* and *M. incognita* var. *acrita* but relatively susceptible to *M. javanica*, *M. arenaria* and *M. hapla*.

4538 Henderson, R. G., Sears, R. D. & Sparsoff, L.
Virginia 312, a new dark, fire-cured variety of tobacco resistant to mosaic and root rot.
Virginia J. Sci. 1957 : **8** : p. 267. (Abst.)

Virginia 312 possesses the *Nicotiana glutinosa* type of resistance to mosaic, as well as a high degree of resistance to root rot caused by *Thielaviopsis basicola* and nematodes. It gives high yields and monetary return per acre. Somewhat brittle, the variety is liable to storm damage.

4539 Schuster, G.
Untersuchungen über die Auswirkungen von Virusbefall auf den Alkaloidgehalt verschiedener Arten und Sorten der Gattung *Nicotiana* L. **(Investigations on the effects of virus attack on the alkaloid content of different species and varieties of the genus *Nicotiana* L.).**
Phytopath. Z. 1958 : **32** : 335–39.

Infection with potato virus X tended to increase the demethylization of nicotine to nornicotine; the varieties and species studied differed in the extent to which this reaction occurred.

4540 Jakovak, A. S.
(Varietal changes and seed production of tobacco).
Agrobiologija (Agrobiology) 1957 : No. 6 : 57–60. [Russian].

Some recent Soviet standard varieties of *Nicotiana tabacum* and *N. rustica* are listed. Among the former are the new small-leaved aromatic varieties: Ostrolist 2747 [Pointed-leaf 2747], which is highly productive of large leaves of high quality; and Trebizond 161, Dubec 566, Dubec 7 and American 287, which are immune from mosaic and *Erysiphe*.

4541 Wood, D. J. & Barua, P. K.
Species hybrids of tea.
Nature, Lond. 1958 : **181** : 1674–75.

Wight and Barua have reported that pellucid dots on the leaves, corresponding to sclereids, are evidence of introgression of *Camellia sinensis* by *C. irrawadiensis* or another species with this feature [XXVII, 3330]. The results of chromatographic analysis of phenolic constituents have suggested that spots characteristic of both *C. sinensis* and *C. irrawadiensis* are indicative of a comparatively simple cross between the two species, and that the chromatogram of a more complex cross, identified by means of the sclereids, may fail to exhibit the spots characteristic of *C. irrawadiensis*.

In its chromatogram for phenolic constituents, a collection from the region of Mount Victoria, Burma, resembles three different F_1 populations raised from *C. sinensis* var. *assamica* x *C. irrawadiensis*. The collection is therefore regarded as a hybrid between these two species. The type is said to have been introduced, presumably as tea, from the Shan States, at the beginінg of the present century.

4542 Harada, S., Toyao, T. & Inaba, T.
(Studies on the utilization of polyploidy in the tea plant. I).
Chagyo Gijutsu Kenkyu/Stud. Tea 1957 : No. 17 : 7–12. [Japanese].

Tetraploid strains have been obtained by colchicine treatment of three diploid varieties and from the progeny of a 3*n* strain of the variety U24. The usual gigas leaf characters were observed.

4543 Wight, W.
The agrotype concept in tea taxonomy.
Nature, Lond. 1958 : **181** : 893–95.

Evidence is given in support of the view that the frequency of calcium oxalate crystals is a valuable criterion for distinguishing agrotypes. This frequency has been estimated on the basis of the total number of crystals in the phloem parenchyma of a complete cross-section of the petiole. The mean crystal frequency of a population is positively correlated with the number of standard shoots which can be obtained by repeated plucking. This relationship is however subject to large seasonal and sampling errors. A closer correlation ($r = 0{\cdot}74$) has been found between mean crystal frequency of a population and mean surface area of the bush as estimated on the basis of the square of the radius in feet (mean of two diameters). The Indian system of pruning and plucking results in a flat horizontal surface, and the method indicated has given a satisfactory measure of relative bush area. A correlation coefficient of $+ 0{\cdot}98$ was obtained between parents and their cross-bred progeny with respect to mean frequency of crystals.

4544 Wight, W.
Agrotype concept in chemical analysis of tea.
Nature, Lond. 1958 : **181** : p. 1355.

A positive genetic relationship has been found between the frequency of cells containing crystals of calcium oxalate in the petiole and the K content of the leaf [4543].

4545 Bahtadze, K. E.
(Soviet tea cultivation).
Agrobiologija (Agrobiology) 1957 : No. 5 : 55–66. [Russian].

Tabulated information on the yields and biochemical properties of the leaves of some varieties which have already been described, is presented [801]. Data on improvements in seed yields by supplementary pollination are also given. Severnyj [Northern], obtained by hybridization involving a Japanese form, proved hardy in the Kuban' foot hills and survived a temperature of − 26° C. It is productive of high quality leaves.

Report of the Cocoa Conference held at Grosvenor House, London, W.1, 10th to 12th September 1957 : Pp. 326.

4546 *Bartley, B. G. D. Trinitario-Scavina hybrids, new prospects for cocoa improvement. (pp. 36–40).*

According to preliminary data obtained at River Estate, Trinidad, hybrids of ICS clones with the witches'-broom resistant Amazonian clones SCA6 and SCA12 merit advanced testing since they have exhibited marked precocity in bearing and given higher yields of dry cocoa per acre than other types at the age of 3–4 years [cf. 2011]. In general, the hybrids are intermediate in pod size between their parents. Hybrids involving SCA6 have proved the least susceptible to witches' broom. Information so far obtained indicates that factors for resistance in SCA clones are dominant to those for susceptibility and that their action is complex. Both SCA6 and SCA12 appear to be heterozygous for the resistance factors, SCA12 being more heterozygous than SCA6. The SCA clones and their hybrids may also offer possible sources of resistance to black pod. Both SCA6 and SCA12 are self incompatible but all crosses made with ICS clones have been successful. Although the progenies of the crosses are all self incompatible, they segregate into groups, trees within the same group being cross incompatible but compatible with trees in other groups. In crosses in which one of the parents is self compatible, such as ICS1 and ICS6, only two groups are formed. When the self-incompatible clone ICS60 is used, four groups are produced. The practical significance of these incompatibility relationships is indicated. Potential uses of the hybrids for commercial planting and in breeding are discussed. Hybridization is under way to include a greater range of Trinitario and other clones as parents in crosses with SCA6, emphasis being given to clones with larger beans. The production of types homozygous for witches'-broom resistance by sib crossing hybrids involving SCA6 has also been initiated.

4547 *Glendinning, D. R. The performance of the introductions and hybrids in W.A.C.R.I. trials. (pp. 41–44).*

Information is given on the performance of the 10 Upper-Amazon hybrids and an eleventh Amazon type, T12 (Scavina), since they were approved and planted for seed issue for the rehabitation of areas in West Africa affected by swollen shoot. A series of trials has been established in Ghana and Nigeria to test the performance of the approved types under different climate and soil conditions. No yield records are yet available. According to measurements of trunk diameter, however, the Upper-Amazon hybrids appear to be superior to the local types in all the trials in Ghana.

While the approved Upper-Amazon types are comparable in flavour to West African Amelonado, an increase in strength would probably be welcomed by the manufacturers. Some increase in bean size is also desirable, and still greater vigour and productivity may be attainable. With a view to obtaining hybrid vigour combined with improved quality, crosses have been made between Upper-Amazon types and Amelonado or local hybrids. These crosses, planted in progeny trials at Tafo, have proved very satisfactory as regards both vigour and bean size. Some clones from local hybrids are giving good yields. Should the issue of clonal material become practicable, the possibilities of these local types must be considered.

4548 *Hammond, P. S. Further experience in Ghana with Upper Amazonian and other new varieties.* (*pp. 44–49*).

A progress report is given on the performance of approved types which have been planted for seed production. Cutting nurseries are being established with a view to providing material for planting clonal seed gardens, the first of which are to consist of Upper-Amazon types and hybrids developed at the West Africa Cocoa Research Institute.

4549 *Braudeau, J. The selection and multiplication of clones at Nkoemvone.* (*pp. 59–65*).

Work undertaken in 1950 at the Nkoemvone Cocoa Station, French Cameroons, is described. Mass propagation of the first clones to be selected has been initiated. Marked heritable differences in rooting ability of cuttings have been found between clones.

4550 *Posnette, A. F. & Entwistle, H. M. The pollination of cocoa flowers.* (*pp. 66–69*).

The mode of pollination of cacao is discussed, chiefly with reference to the problem of the identity of the insect pollinators.

4551 *Quesnel, V. C. Curing cocoa in the laboratory.* (*pp. 150–56*).

Methods already proposed as suitable for small-scale curing in breeding and information on the biochemistry of curing are reviewed. The following method of nonmicrobial curing has been devised at the Colonial Microbiological Research Institute. The beans are removed from the pod and placed in a washing machine with a few rubber bungs. Water is added and the machine operated until the pulp has been washed off (*ca.* 2 hr.). The beans are removed and rinsed and the excess water dried off. A sample of 225 g. is put in a 1 lb. Kilner jar, into which ethanolic acetic acid solution (225 ml.) heated to 50° C. is then poured. The jar is sealed and placed in the incubator at 45° C. for 48 hr. Finally, the beans are rinsed twice with tap water and spread out on the laboratory bench to dry. The method causes no loss in flavour.

4552 CIFERRI, R. & CIFERRI, F.
The evolution of cultivated cacao.
Evolution 1957 : **11** : 381–97.

The outstanding position of Venezuela as centre of evolution of the best commercial cacaos is emphasized. The taxonomy of cultivated cacao is discussed and the morphological characteristics of the pods and system of classifying the fresh beans used by the authors are outlined. After an indication of the regions of cacao cultivation in Venezuela, the types found in that country are described, viz. ssp. *typica* (Criollo cacaos), hybrids between Criollos, Porcelain (believed to be an albino mutant of Amazonian Forastero or ssp. *leiocarpa* 'Calabacillo'), Criollain (hybrids between Criollo types and Porcelain), and Forastero hybrids. The Forastero types comprise: (1) Amazonian, (2) Orinocan (Calabacillo or Amazonian Forastero x Criollo), (3) Trinitarian (Orinocan Forastero x Criollo) and (4) Venezuelano (Trinitarian x Criollo). The probable course of the evolution and distribution of the various types in different parts of Venezuela is discussed.

4553 FELECAN, V., MLEŞNIŢĂ, L. & BUCUR, I.
Contribuţii la ameliorarea macului. (**Contributions to the improvement of the poppy**).
Stud. Cercet. Agron., Cluj 1957 : **8** : 147–60.

Seven varieties and numerous breeding lines have been compared in respect of number of placentas, seed yield and morphine content. Special mention is made of the lines Cluj R and Cluj A which respectively produce 652 and 711 kg./ha. of seed and have a morphine content of 0·62% and 0·63%.

4554 Neve, R. A.
Sex chromosomes in the hop *Humulus lupulus*.
Nature, Lond. 1958 : **181** : 1084–85.

Meiosis was investigated in six ♂ plants at Wye College, England. Five were seedlings from open pollination of wild Canadian or New Mexican ♀ parents; the remaining plant was of unknown origin. In all six a heteromorphic pair of chromosomes was distinguished. In four plants a quadrivalent association was also found. The heteromorphic pair was a constant feature in all cells but the quadrivalent was not present in some nuclei. Probably the heteromorphic pair consists of the sex chromosomes, in which case the quadrivalent must be an association of autosomes.

MINOR CROP PLANTS

4555 Nevstrueva, P. I. & Skurat, D. F.
(Essential-oil plants in the Soviet Union).
Agrobiologija (Agrobiology) 1957 : No. 6 : 68–75. [Russian].

Breeding work with essential-oil plants at the Nikita Botanical Garden and the Alekseevka and Crimean Zonal Stations is discussed and new varieties of *Lavandula, Ocimum gratissimum, Rosa, Salvia, Mentha* and *Coriandrum* from the above institutes are described. Most of them outyield the previous standard varieties, are hardier and produce oil of superior quality. The lavender varieties N 328, N137 and 180 are resistant to mildew.

4556 Maslova, T. A.
(A new form of geranium for essential oil).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 71–72. [Russian].

Hybrid 220K24 (*Pelargonium capitatum* x *P. radula*) was bred at Suhumi. It produces 41 kg. high quality oil per ha., as compared with 19 kg. oil of an inferior kind from *P. roseum*, which is commonly grown in Abhazia. The hybrid has a habit suitable for combine harvesting.

4557 Peterson, P. A.
Cytoplasmically inherited male sterility in *Capsicum*.
Amer. Nat. 1958 : **92** : No. 863 : 111–19.

The male-sterile condition in *Capsicum* was found to result from the interaction of a specific cytoplasm and a nuclear gene *ms*; only the homozygous condition *ms ms* in combination with S cytoplasm caused sterility. Any plant was fertile if it had normal cytoplasm or carried the dominant gene Ms_1, which restores fertility. In crosses involving the Floral Gem variety, some evidence was found for the existence of a second locus, Ms_2, also restoring fertility and independent of Ms_1. Six commercial varieties and six Bureau of Plant Introduction accessions carried Ms_1 and two accessions and four commercial varieties carried ms_1. In the sterile plants, seed set is reduced by approximately one half. Differences in anther appearance and pollen production were observed amongst the sterile plants. The expression of sterility appeared to be influenced by modifying genes which were characteristic for different varieties. Also under cool conditions, the pollen production of sterile plants was increased.

4558 Benedek, L.
A fűszerpaprika festéktartalmának meghatározása. **(Determination of content of pigments in red pepper).**
Növénytermelés 1957 : **6** : 145–54.

A rapid method is described. The pigments are extracted with 50 ml. benzene from 25 g. of the ground pericarp of fruit which has been ripened for at least five weeks after picking. 5 ml. of the solution are made up to 50 ml. with benzene and the extinction determined in a Pulfrich photometer with an S50 filter. The result is calculated from a calibration curve for capsanthin and the value obtained, called the total pericarpial pigment content, is expressed as g./kg. The method gives values similar to those obtained by chromatography and has the advantage that, from prepared material, 30–40 determinations can be made in 8 hr. by one worker.

4559 Ždanov, L. A.
(The principal results of scientific researches with oil plants).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 53–64. [Russian].

This review of breeding work with *Brassica juncea*, linseed, sunflower and other oil plants mentions some practical achievements which have already been reported [XXVII, 166–82].

4560 **Better-yielding niger.**
Indian Fmg. 1958 : **8** : No. 1 : p. 17.

A new variety of *Guizotia abyssinica*, N–12–3, has been bred at the Agricultural Research Station, Niphad, Bombay State; mention is made of its improved yield and oil percentage.

4561 ELLENA, G.
Colza e ravizzone: specie a duplice attitudine. (**Colza and swede rape: two species with dual purpose**).
Sementi elette 1958 : **4** : No. 1 : 48–53.

The two species are described and a plea is made for more attention to their improvement by selection, both as oil and forage plants.

4562 Forsøg med Stammer af Vinterraps 1950–57. (**Trials of strains of winter rape, 1950–57**).
Tidsskr. Frøavl 1958 : **23** : 412–13.

The four varieties tested showed little difference in yield. The tests were conducted on various soil types in Denmark.

4563 OLSSON, G. & PERSSON, B.
Inkorsningsgrad och självsterilitet hos raps. (**Degree of cross pollination and self sterility in swede rape**).
Sverig. Utsädesfören. Tidskr. 1958 : **68** : 74–78.

Earlier estimates of the degree of cross pollination occurring in swede rape are surveyed and tabulated [cf. XXIII, 1394, XXVII, 4275 and XXVIII, 2028]. Exceptionally high values found among a number of plants and excluded from the previous results for this reason have been confirmed, values as high as 100% having been observed in some individuals; these plants are regarded as probably self sterile, or at least as showing a marked preference for foreign pollen. The mean rate of cross pollination for all the material was about 36%, for the self-fertile portion about 30%.

4564 GHEIKING, A. & IOAN, E.
Rezultatele experienţelor cu soiuri de ricin. (**Results of experiments with castor oil plant varieties**).
Lucr. Inst. Cerc. aliment. 1958 : **2** : 375–86.

Details are provided on the productivity and vegetative period of a series of varieties tested in Rumania during 1952–5. The Soviet variety Sanguineus 401 did best.

4565 CLAVIER, C.
Note sur les travaux d'amélioration du ricin au Maroc. (**A note on the work of improving the castor oil plant in Morocco**).
Terre maroc. 1955 : No. 304 : 3–7.

Mitosis and meiosis were found to be normal in *Ricinus communis* var. *minor*, *R. communis* var. *major*, *R. persicus* and *R. zanzibarensis*. In each case twenty small chromosomes were counted during metaphase; the chromosomes were of three morphological types. During meiosis, associations of two groups of three pairs or of three groups of two pairs seemed to be most frequent. No marked differences in chromosome structure or behaviour were observed between the different types of *Ricinus*. Information is presented on the performance in Morocco of some perennial and annual varieties, including types of local and foreign origin.

4566 MATSUOKA, K.
(**Studies on sesame varieties. I. On productivity**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 849–50. [Japanese].

Information is provided on the yield, oil content, vegetative period and agronomic characteristics of a series of introduced and Japanese varieties.

4567 COLLISTER, E. H.
Improvement of sesame.
Bull. Hobitzelle agric. Lab. Tex. Res. Found. 1955 : No. **4** : Pp. 42.

An account is presented of studies on sesame carried out by the Texas Research Foundation since 1947; a botanical description and information on the chemical composition of the seed and on the adaptation, pests and diseases of sesame is included. The primary aim in breeding has been the development of non-shattering strains; the breeding methods and techniques used are described. The multiple-cross method was used for crossing dehiscent types with indehiscent types and some particularly vigorous and productive forms were so obtained. Tabulated data are presented on the agronomic and chemical characteristics of some promising indehiscent lines; P15, a selection from Nebr. 1256–1 x Nebr. 790–1243–3–4 has desirable agronomic characters and is particularly suitable for mechanical threshing. The semiindehiscent strain P45 is also promising; it is a pure-line selection from the cross Kansas 10–1 x Nebr. 790–1243–4–4. The indehiscent strain P6 (Arizona (Y)7 x Nebr. 790–1243–6–7) has some undesirable characters but is a useful source of germ plasm, conferring the long-pod character, vigour and drought resistance. Renner 2 is an improved dehiscent strain selected from a cross between Kansas 10–1 and Nebr. 1040–2; it is highly productive, vigorous and early [cf. XXVI, 3633]. Renner 1 [cf. XXIV, 2345] was developed from Kansas 10 by successive bulk selections.

4568 WILLEY, L. A. & BUNTING, E. S.
Linseed trials 1952–55.
J. nat. Inst. agric. Bot. 1957 : **8** : 96–105.

The results of 17 variety trials in England are reported. The varieties mainly tested were Svalöf Oilflax II, Valuta, Dæhnfeldt Elite 6, B1528, Dakota, Redwood and Trifolium Record. The first four varieties gave good seed yields.

4569 Forsøg med Sorter af Oliehør 1953–57. (**Trials of varieties of linseed, 1953–57**).
Tidsskr. Frøavl 1958 : **23** : 418–19.

Four varieties have been tested on different soil types in Denmark. The results given include data on yields of seed, straw, crude oil and crude protein and tendency to lodge.

4570 D'Amato, F.
Fasciazioni caulinari e fiorali, sterilità ed altre modificazioni di sviluppo indotte dalla irradiazione cronica gamma da radiocobalto nel lino. (**Fasciations of the stem and flower, sterility and other developmental modifications induced in flax by chronic γ irradiation from radiocobalt**).
Nuovo G. bot. ital. 1957 : **64** : 1–18.

Seeds of the linseed variety Bison were sown in concentric arcs around the radiation source of the gamma field of the Brookhaven National Laboratory. A high incidence of fasciation of the stems and flowers, accompanied by anther abortion, occurred in plants grown from seed that had received 190 r./day or higher doses.

4571 Kováčik, A.
Nový spôsob kastrácie slnečnice. (**A new method of emasculating sunflowers**).
Pol'nohospodárstvo 1957 : **4** : 987–97.

The development of the anthers can be retarded till after the stigmas are mature by placing black paper bags over the heads. It is only necessary to deal with the outer 200–300 florets; the remainder can be dispensed with.

4572 Jackson, R. C. & Guard, A. T.
Natural and artificial hybridization between *Helianthus mollis* and *H. occidentalis*.
Amer. Midl. Nat. 1957 : **58** : 422–33.

Natural hybrids between these two species were analysed and artificial hybrids grown. The hybrid is intermediate in morphological characters, producing 50% stainable pollen; a ring or chain of four chromosomes is usually observed at diacinesis, which indicates that the two species differ in a chromosomal interchange.

4573 Gvozdeva, Z. V.
(**A rare instance of the development of female plants in the sunflower**).
Priroda (Nature), Leningrad 1958 : No. **3** : 115–16. [Russian].

A high percentage of male-sterile plants was found among the first and second seed generations of the graft hybrids Armavir 1813 sunflower/*Helianthus tuberosus* 'Kievskij Belyj' [Kiev White] and Stepnjak Ždanovskij [Ždanov's sunflower from the Steppe]/*Tithonia speciosa* var. *grandiflora*. The plants had normally developed pistils but malformed anthers which did not emerge from the corollas. The pollen was sterile. Open-pollinated plants or those fertilized by pollen from normal plants set seed. Some families obtained from these male-sterile plants showed heterosis for yield and had large seed heads, tall stems and thick foliage.

4574 Knowles, P. F. & Ashri, A.
Wild safflower in California.
Calif. Agric. 1958 : **12** : No. **4** : 4–5.

At the Agronomy University of California, wild species of safflower are being studied to find whether they have desirable characters which could be transferred to cultivated *Carthamus tinctorius*. Two wild species, *C. lanatus* and *C. baeticus*, are described; they are both resistant to rust. Crosses between *C. tinctorius* and *C. lanatus* were sterile; *C. tinctorius* has not been successfully crossed with *C. baeticus*.

4575 Hartley, C. W. S.
Advances in oil palm research in Nigeria in the last twenty-five years.
Emp. J. exp. Agric. 1958 : **26** : 136–51.

Among other topics discussed are the results of crosses among *dura*, *tenera*, *pisifera* and Deli palms, methods of selection, studies of the inheritance of form, type and colour characters and the importance of the sex ratio in determining yield.

4576 Moffett, A. A. & Nixon, K.
Genetical studies in acacias. II. Leaf characters in hybrids between black and green wattles.
Heredity 1958 : **12** : 199–212.

The material used in these investigations, which were carried out at the Wattle Research Institute, University of Natal, consisted chiefly of five sister families from tree G35 of green wattle (*A. decurrens*) pollinated by tree B18 of black wattle (*A. mollissima*). The characters measured were number of pairs of pinnae and number, length and spacing of pinnules. The F_1 hybrids were considerably reduced in fertility compared with the parents, and abnormal seedlings occurred in the F_2. The F_1 trees were however much more fertile when back-crossed with the black than with the green-wattle parent. Both parents and F_1 hybrids had $2n = 26$. Since meiosis in the latter was highly regular, it is assumed that the reduction in fertility and abnormal F_2 seedlings were due to genic unbalance. The four characters appeared to be polygenically inherited, significant differences between sister F_1 trees being found, with the exception of pinnule length. These differences tended to persist in the F_2 and back-cross families, showing a parent-progeny correlation. A marked tendency for characters from one species to remain associated was detected. F_2 families differed significantly, however, with respect to the correlation values between pinnule spacing and length and between pinnule number and number of pairs of pinnae. The heterogeneity of these correlations was probably due to changes in linkage relationships. Differences among the F_2 families in correlation values for other combinations among the four characters were within the limits of sampling errors. Because of the blending nature of polygenic characters and the tendency for parental characters to remain associated, it is concluded that, unless a desirable character controlled by major genes is detected in green wattle, a large-scale attempt to combine the qualities of the two species is not justified. It is however suggested that the shorter time taken by green wattle to ripen its seed, a character apparently conditioned by two dominant major genes, merits consideration from the point of view of breeding. Some indication has already been obtained that transfer of this property to black wattle by back crossing will be relatively easy.

4577 Paris, M. R.
État actuel de la production des plantes médicinales en France. (**Present state of medicinal-plant production in France**).
CR Acad. Agric. Fr. 1958 : **44** : 352–57.

A brief mention is made of the breeding of medicinal plants at the experimental station at Milly.

4578 Sprecher, E.
Über den Einfluss genetischer und klimatischer Faktoren auf die Biosynthese sekundärer Pflanzenstoffe der Weinraute (*Ruta graveolens*). [**On the influence of genetic and climatic factors on the biosynthesis of secondary plant materials in rue (*R. graveolens*)**].
Pharmazie 1958 : **13** : 151–53.

A higher essential oil content was found in plants from the French Riviera than in plants from Karlsruhe, Germany, the difference being maintained in subsequent generations grown at Karlsruhe. The German plants were higher in flavonol content than the French. Essential oil formation appeared to be favoured by warm conditions and flavonol synthesis by light.

4579 **Budding and clonal seedlings.**
RRI Plant Bull. 1958 : No. 36 : 51–59.

The relative merits of budded clones and clonal seedlings of rubber are discussed, with reference to the performance of the two types of improved material in estate trials in Malaya.

4580 **Clones RRIM 600 to 618.**
RRI Plant. Bull. 1958 : No. 36 : 65–69.

Rubber clones RRIM600–618 are being compared with RRIM501 and Tjir 1 in a large-scale trial at the Sungei Buloh station, Malaya. The results from the second year of tapping are reported [cf. XXVII, 4289].

4581 Langford, M. H.
The status of *Hevea* rubber planting material for use in tropical America.
Turrialba 1957 : **7** : 104–10.

Information is given on the performance of (1) clones of *H. brasiliensis* top-budded with clones resistant to blight (*Dothidella ulei*) and (2) blight-resistant clones developed from cross-pollinated progeny. It is expected that the current trend of the replacement of (1) by (2) will continue. Recommended clones of the second type were derived from the F_1 of crosses between high-yielding clones of *H. brasiliensis* and blight-resistant *H. brasiliensis* or *H. benthamiana* selections. First back-cross progenies are now coming into production and second back-cross progenies will be tappable within a few years.

FRUITS AND NUTS

Fourth Annual Report of the Scottish Horticultural Research Institute 1956–1957 : Pp. 55.

4582 *Wood, C. A. Pomology.* (*pp. 9–14*).
Raspberry. A preliminary assessment was made of four intervarietal crosses each involving Malling Exploit. As in the case of previous crosses with Malling Jewel as one parent, many of the seedlings had thorny canes and soft-textured fruit. As the start of a longer-term programme, which will entail a considerable amount of initial inbreeding, some 30 varieties and seedlings were selfed. Five out of 15 inter-specific crosses of *Rubus* resulted in seed.
Currant. Difficulties hindering the commercial development of blackcurrant production include

the susceptibility of many British varieties to frost and cold weather in spring and their inability to ripen quickly or with sufficient uniformity on the strig for the bulk of the fruit to be cleared in one picking. Crosses are therefore being made between British varieties and introductions from Canada and northern Europe. A longer-term programme is based on inbreeding of varieties and species and on interspecific hybridization.

4583 *North, C. Vegetable culture. (pp. 15–19).*

Brussels sprouts. F_1 selections from crosses between Ashwell's strain, Cambridge Special, Amager and Castricum Glory were selfed in the greenhouse by the bud-pollination technique; 94% of the buds developed capsules, each containing 20–30 seeds. F_2 and back-crossed families were selected for yield and quality. Individual families from selfed sibling F_1 plants often differed considerably in morphological characters and strain uniformity.

Cabbage. Further selection of material derived from crosses between January King, Amager, Blotopp, Danish Keeping and Christmas Drumhead was effected.

Bean. Back crosses of *Phaseolus multiflorus* x *Ph. vulgaris* to the latter are under investigation.

4584 *Wills, A. B. Genetics. (pp. 23–24).*

Strawberry. Spring chlorosis, with special reference to June yellows, is being studied by observing the behaviour of seedlings from selfs and crosses of varieties.

Currant. The possibility of combining the frost resistance of the red currant and other *Ribes* spp. with the fruit characters of the black currant is being explored. Progress has already been made in crossing black and red currant varieties.

Brassica. In collaboration with the Atomic Energy Research Establishment, Harwell, England, an attempt is being made to induce mutations suitable as markers or of horticultural value by treating cabbage and Brussels sprouts seeds with γ rays and thermal neutrons.

4585 *Reid, R. D. West of Scotland Unit (Auchincruive). (pp. 34–37).*

Strawberry. Selection of seedlings for resistance to red core continued and additional crosses were made which consisted of (1) crosses between selections or varieties with desirable commercial qualities, (2) back crosses of interspecific hybrids and (3) multiple back crosses. A larger proportion of susceptible seedlings has been detected by the laboratory than by the greenhouse-bench method of screening. Many seedlings escaping infection in bench tests become infected in the field. Some seedlings have however become only slightly infected and have maintained this field resistance for upwards of three years.

4586 *Reid, R. D. New strawberry variety "Redgauntlet". (pp. 41–42).*

Redgauntlet (the American seedling NJ1051 x Auchincruive Climax) bears round conical fruits, medium-sized to large or very large and scarlet or crimson. When ripe the fruit lies on the ground, well clear of the foliage. This characteristic facilitates picking and appears to reduce liability to *Botrytis* rot. The fruits have good transportability and ripen about one week earlier than those of Talisman or Climax. Redgauntlet is resistant to some of the common races of *Phytophthora fragariae* but less resistant than Talisman to some of the specialized races attacking Climax and other varieties.

4587 *North, C. & Frith, L. H. Variety trials of vegetables in Scotland. II. Stringless types of dwarf French beans: Invergowrie 1954–1956. (pp. 43–47).*

The results indicated that Masterpiece is justifiably considered as a high-yielding variety for Scottish conditions. Record, Saxa and Konserva II also gave good yields and may be suitable for various uses.

4588 *North, C. & Frith, L. H. Variety trials of vegetables in Scotland. III. Brussels sprouts: Invergowrie 1952–1957. (pp. 48–55).*

Evesham Special, Cluseed, Cambridge Special and Sanda were singled out by their high yield of good-quality sprouts as being especially suitable for Scotland. Yield of saleable sprouts depended more on a high total weight of side shoots per plant than on characters making the sprouts unmarketable, such as susceptibility to rotting, frost and "blowing". In breeding most attention should therefore be given to weight of side shoots.

Annual Report of the East Malling Research Station, near Maidstone, Kent, 1st October, 1956 to 30th September, 1957 (1958) : Pp. 173.

4589 *Rogers, W. S. Pomology. (pp. 5–11).*

Pome fruits. Fruits have been obtained from Beurré Superfin pear x Angers quince and seedlings from pear x apple hybrids are under observation. Seedlings from crosses of Cox's Orange Pippin, Court Pendu Plat, Crawley Beauty and Edward VII, pollinated by a number of selected varieties and self pollinated, have been classified for season of leaf break [cf. 4595] and the development of woolly-aphid resistant varieties has continued. Final selections are being made among families raised with a view to the production of new varieties of good fruit quality and extended season.

Prunus. In spite of self-incompatibility in some cases, about 1700 seeds have been obtained from crosses between and within four mazzards. Seedlings from crosses between mazzards and related *Prunus* species of dwarfing habit are being tested for their possible usefulness as rootstocks.

Raspberry. In variety trials seedlings T and H and Lloyd George showed the least attack by spur blight and *Botrytis* in the period 1947–56 and seedling T gave excellent yields. Breeding for resistance to *Amphorophora rubi* continued and the inheritance of tip rooting and suckering has been investigated. [Cf. 4594].

Ribes. The study of meiosis in interspecific hybrids has been continued [cf. 4597].

Strawberry. In trials comparing heat-treated and untreated clones, vigour differences were in favour of the treated clones, especially in the case of Cambridge Favourite. Treated clones of this variety, Huxley, and Perle de Prague gave higher yields than untreated clones but the reverse was true of Early Cambridge and Cambridge Rearguard, owing to reduced blossom development apparently associated with excessive vigour [cf. 4593].

4590 *Harris, R. V. Plant pathology. (pp. 22–27).*

All of the eleven new hop seedling varieties developed in cooperation with Wye College proved to be as tolerant of wilt as OR55 and the final selections will be included in commercial scale trials. Wilt-free stocks of the East Malling varieties D/1 and D/3 have been made available to the Propagation Committee of the Hops Marketing Board prior to their release. These varieties and J/2, which will also be released, have maintained a satisfactory level of tolerance in commercial farm trials.

A field trial has been planted to investigate the effect of five virus diseases on the cropping of four plum varieties.

A virus disease tentatively named "yellow crinkle" has been recorded in several strawberry varieties known to be tolerant of the usual crinkle virus complex and preliminary transmission tests indicate that it is different from the usual crinkle disease, not merely a severe form of it.

4591 *Massee, A. M. Entomology. (pp. 28–31).*

All the apple seedlings from Court Pendu Plat x Northern Spy and Court Pendu Plat x Crawley Beauty found resistant in tests in the previous year continued to show resistance to woolly aphid while 50% of the new seedlings from Court Pendu Plat x Northern Spy were resistant.

4592 *Rogers, W. S. Malling 26, a new semi-dwarfing apple rootstock. (pp. 48–49).*

The new rootstock described here originated from a cross between MXVI and MIX and has been tested under the designation 3436 [XXV, 467–8]. In height and spread, trees of Cox's Orange Pippin on M26 are intermediate between those on MVII and MIX and similar results have been obtained with other varieties. Precocity, yield, vigour and anchorage were also intermediate and it is free from rubbery wood and mosaic viruses.

4593 *Rogers, W. S. & Fromow, M. G. The field performance of heat-treated strawberry clones. (pp. 50–56).*

The results of a trial referred to earlier [4589] are presented in detail and discussed.

4594 *Knight, R. L. & Keep, E. Developments in soft fruit breeding at East Malling. (pp. 62–67).*

Raspberry. The introduction of virus-free or virus-tolerant varieties and the use of heat therapy to eradicate viruses have lessened the immediate needs for new varieties and breeding is now aimed at the development of improved parents for the production of varieties exhibiting the greatest degree of hybrid vigour obtainable. One of the primary lines, designated P1, is now in its third inbred generation, is more or less pure for large fruit and is known to impart high yield potential to its hybrid progeny. Of two other advanced inbred lines, P2, from Reid's Seedling AR1, a self of Burnetholm, is homozygous for absence of thorns and carries genes for excellent flavour, while P3, from Norfolk Giant, is pure for lateness and for fruit of regular shape with small drupelets. Six inbred lines in their first generation include types with outstanding flavour, large well-shaped fruit with good flavour or high yield potential. The back-cross technique is being used to transfer a number of characters to the three primary lines, including resistance to *Amphorophora rubi*, *Elsinoe veneta* and virus, thornlessness, hairiness of the cane, autumn fruiting, dwarfing habit, male sterility and flavour and firmness of fruit. It has been found that normally the Baumforth A level of resistance can be used to reduce populations of *A. rubi* to a level at which the spread of virus would be markedly reduced, but in one locality an aberrant strain of the aphid, which can multiply on the resistant varieties, has been found; fortunately this strain has a markedly poorer level of survival than the normal strain and a source of resistance to it has already been found. The Baumforth A type of resistance is now known to be determined by a single partially or fully dominant gene, A_1, linked to the normal allele of a semilethal dwarfing gene, frilly, with a cross-over value of approximately 3·3%. The transference of A_1 to Pl has reached the second back-cross stage.

The American variety Newburgh has been found to possess resistance to, or tolerance of, a large group of viruses and to pass on its resistance to its hybrid progeny, although the type of segregation occurring suggests that it is heterozygous for resistance.

In order to combine autumn fruiting and dwarf habit, crosses have been made among commercial varieties, *Rubus occidentalis* and *R. arcticus*.

The thornless character, controlled by a recessive gene from Burnetholm, is expected to reduce mechanical damage to fruit by high winds, as well as making picking easier. Since the thornless habit is associated, when homozygous, with the absence of glandular hairs on the cotyledons, the desired plants can be selected at an early stage.

Hairiness of the cane is controlled by a dominant gene and it has been observed that varieties with hairy canes show a greatly decreased degree of attack by *Botrytis*. Although it is thought that the reason for this is mechanical rather than a form of intrinsic resistance nevertheless it will be of considerable value.

Male sterility, also derived from Burnetholm, is controlled by a recessive gene. It is hoped to use it in breeding and in the production of hybrid seed from inbred lines.

Black currant. In order to increase the length of the strigs, crosses have been made between *Ribes nigrum* and *R. longeracemosum* but the F_1 plants are almost completely sterile. Four seeds were obtained in 1957 and attempts at colchicine doubling have been made but those shoots which appear mixoploid or polyploid have not yet flowered.

Progeny have also been obtained from crosses with red currants. The 60 seedlings obtained show extreme segregation in respect of habit and leaf shape. Some have been treated with colchicine and one tetraploid obtained which will be back crossed to Baldwin. Other crosses made are *R. nigrum* x *R. multiflorum*, from which 99 nonviable seeds were obtained, *R. rubrum* x *R. koehneanum* (*R. sativum* x *R. multiflorum*), giving 264 seeds of which 117 germinated and grew, and *R. rubrum* x *R. urceolatum* (*R. multiflorum* x *R. petraeum*) which gave 27 seeds of which eight germinated and grew.

In breeding for large fruit size, crosses have been made with gooseberry varieties [cf. XXVII, 4326] and back crossing of the allotetraploid progeny to Baldwin black currant is in progress. Crosses have also been made between the hybrids and tetraploid black currants but final back crosses will be made to diploid material to reestablish the diploid condition. Seeds have also been obtained from crosses between tetraploid black currants and large-fruited diploid gooseberries.

Gooseberry. With a view to producing varieties with reduced spininess crosses have been made between a semispineless seedling from Spine-free x Clark and Lancashire Lad. All the progeny were spiny when young but in their third season showed a marked reduction in spininess. Since they are almost completely self sterile it has not been possible to recover the genes responsible in the homozygous condition but a large progeny has been raised from a cross between one of these plants and Whinham's Industry and it is hoped to isolate larger-fruited, semispineless forms. It is hoped also to obtain spineless forms from back crosses of the black currant x gooseberry hybrids to gooseberries but none of the plants obtained so far have flowered, although all are spineless after the juvenile stage.

4595 *Tydeman, H. M. The breeding of late flowering apple varieties.* (*pp.* 68–73).

Progress since 1953 is reviewed. Cox's Orange Pippin has been used as the main source of quality and other desirable characters while about 30 varieties, out of 90 originally tested, were selected as being sufficiently late flowering to be used in this programme. Data on the flowering times of 35 varieties, compared with Crawley Beauty, are tabulated for the period 1952–57. Crosses have been made between Cox's Orange Pippin as seed parent and 17 named late flowering varieties, two selected seedlings, five other species of *Malus*, four of which are markedly late flowering, and other named varieties of good quality. Most pollen parents proved compatible and the number of pollinations, fruits set, seeds produced and seedlings obtained are tabulated for the 45 crosses made. Since late flowering is associated with late leafing, observations may be made on this character before the progeny reach flowering age. A further table shows the time of leaf break, early, midseason, late or very late, for 19 families, including more than 23,000 seedlings, with the number and percentage of the seedlings in each group. Many of these seedlings have shown infection by apple mildew and no clear indication of the inheritance of varietal resistance has been found although the results suggest that Cox's Orange Pippin does not carry any dominant resistance genes. The incidence of mildew during 1954–57 and apple scab in 1956 and 1957 is also tabulated. About 5% of the seedlings have been selected for fruiting trials, on the basis of pronounced late leafing and complete freedom from mildew and scab, except in the case of the selfed Cox seedlings which are all being grown on for observation.

4596 *Knight, R. L. & Keep, E. An early sport of a red currant. (p. 74).*

A branch of seedling B56 has, for four years, been markedly earlier in leafing out, flowering and fruiting than the rest of the bush and also other plants of the same clone. This branch produces fewer fruits per strig, probably as a result of poorer pollination conditions at the time of flowering; the fruits are smaller and contain fewer seeds. The early form has been propagated by cuttings and is thought to be the result of a single gene mutation.

4597 *Keep, E. Cytological notes. (pp. 75–78).*

Apple. A sport of Laxton's Superb has been shown to be a chimera with a diploid epidermis surrounding a tetraploid core. It exhibits the usual characters of such a chimera.

Prunus. The following chromosome counts are reported for some plum and cherry rootstocks and other *Prunus* species: $2n = 16$, F12/1, Myrobalan B E10/2, *P. canescens* 'G254', *P. glandulosa* var. *alboplena* 'G256', *P. japonica* var. *nakaii* 'G257', *P. spontanea* and *P. tenella*; $2n = 32$, *P. pseudocerasus*; and $2n = 48$, Common Mussel E5 and Damas C E17/3.

Rubus. Some plants of family 139 from (*R. occidentalis* x *R. idaeus*) x *R. idaeus* were found to be triploid with $2n = 21$, and were vigorous but almost completely sterile while other plants in this family and in two others from the same cross were diploid, with $2n = 14$, and completely fertile. It is suggested that the triploids were derived from unreduced ovules and that the comparative effectiveness of reduced and unreduced ovules is influenced by the male parent, in view of the absence of triploid progeny in one family. Triploid progeny have also been obtained from (*R. palmatus* x *R. idaeus*) x *R. idaeus*. The following chromosome numbers are reported: $2n = 14$, *R. crataegifolius* 'L535' and *R. hawaiiensis* 'L574'; and $2n = 38$, *R. henryi* var. *bambusarum* 'L457' and 'L523, and *R. tricolor* 'L464'.

Ribes. Meiosis has been studied in a number of interspecific hybrids and the average chiasma frequency and bivalent number per cell are tabulated for two examples of *R. nigrum* x *R. grossularia* and one each of *R. nigrum* x *R. longeracemosum*, *R. koehneanum* (*R. multiflorum* x *R. sativum*) and *R. saundersii* (*R. nigrum* x *R. hudsonianum*). The results indicate a closer genome relationship between *R. nigrum* and *R. longeracemosum* than between the first species and *R. grossularia* and a closer relationship still within the red currant and black currant sections, as shown by *R. koehneanum* and *R. saundersii* respectively. The failure of attempts to produce hybrids between the red currant and gooseberry sections indicate that these two groups are further separated than are the black currant and gooseberry sections.

4598 *Maggs, D. H. A comparison of the growth patterns of two apple rootstock varieties during their first year. (pp. 101–05).*

"Rooted layers of the apple rootstock varieties M.II and M.XVI (of average and late natural bud-break) were made to break into growth over a period from early March to mid-June. Extension growth and leaf number were measured during the growing season and dry weights determined at the end of September.

"The time trends of stem elongation, leaf number, leaf area and of dry weight 70–190 days after bud-break were linear and the same for both varieties, and the dry weights of plants having the same growing periods did not differ significantly. The varieties differed in the proportion of stem and root, M.II developing more stem and M.XVI more root for plants of the same weight. The average increase in weight per g. leaf was lower for M.II than for M.XVI. It is suggested that this is due to the larger 'sink' afforded by the greater cambial surface of the root system of M.XVI, and a mode of action of rootstock effect is adumbrated in these terms".

4599 *Montgomery, H. B. S. Progress in research in fruit crops in 1957. (pp. 164–69).*

A popular account is presented of work discussed in detail in the more technical sections of the report.

4600 Der Schraderhof—20 Jahre Forschungsanstalt der Martin-Luther-Universität Halle-Wittenberg. **(The Schraderhof—20 years as a research institute of the Martin Luther University, Halle-Wittenberg).**
Dtsch. Gartenbau 1958 : **5** : 46–47.

A brief survey is presented of some of the fruit breeding carried out at the above station during the last 20 years.

4601 **New varieties for Northern Plains.**
Fruit Var. hort. Dig. 1957 : **12** : p. 2.

Fruit varieties developed at the Northern Great Plains Field Station, Mandan, N. Dak., and recently released by the US Department of Agriculture are briefly described.

Apple. Garrison (Duchess x Starking Delicious) bears medium-sized red fruits with carmine stripes and ripens in early September. Thorberg (Duchess x Starking Delicious), produces medium to large red fruits with carmine stripes and ripens from middle to late September. Ripening in the second half of September, Peace Garden (Malinda x Duchess) has bright glossy red fruits with carmine stripes and a waxy skin. Killard (McIntosh x Dolgo) ripens in mid-September and bears medium-sized or smaller fruits splashed and striped with red. All four varieties are especially suitable for cooking; Peace Garden also has good dessert quality.

Plum. Gracious, a seedling of Emerald, combines the characteristics of *Prunus americana* and *P. salicina*. Ripening in late August, the fruits are large and roundish, mottled red and freestone. Chinook, a seedling of Ojibwa, also ripens in late August. Its fruits are large, bright red and partly freestone. Both varieties have good cooking quality.

Sand cherry - plum hybrids. Sacagawea and Hiawatha, seedlings of Sapa, produce semifreestone fruits with dark red flesh, mottled purple skin and a fairly sweet flavour. They ripen in mid-August.

Apricot. A selection from seed obtained from Manchuria, Mantoy produces largish, golden yellow, freestone fruits suitable for dessert or cooking and ripening in early August.

4602 Maurer, K. J.
Ein Beitrag zur Obstsorten-Konstitutionsforschung als moderne Sortenkunde. **(A contribution to research on the constitution of fruit varieties as the modern basis of varietal studies).**
Mitt. Klosterneuburg : Ser. B. : 1958 : **8** : 137–60.

By reference to many examples, the author explains the importance of having a thorough knowledge of the characters which determine the reaction of fruit varieties to various environmental conditions and hence their performance in different regions. Since the characters of a variety are largely determined by its pedigree and provenance, it is particularly important that these should be known; as an example, such information is provided for a series of apple varieties. A plea is presented for international cooperation in obtaining more complete knowledge of varietal characteristics and variability.

4603 Buzulin, G. S.
(A gifted breeder).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 54–55. [Russian].

This short biography, written on the occasion of the eightieth birthday of S. F. Černenko, mentions apple and pear varieties bred by him in the Ukraine and later at Mičurinsk. The apples are interesting for high quality and productiveness and the pears for combining hardiness with dessert quality. A brief reference is made to Černenko's contribution to Mičurinism, in particular his observation that hybrids may develop new characters, absent in both parents.

4604 **Scottish Agricultural Improvement Council. Report on fruit trials in Scotland 1949–1956** (1957) : Pp. 38.

The results of varietal trials on plums, black currants, raspberries and strawberries are summarized. The trials included processing tests in the case of the last three crops.

4605 Lantz, H. L.
New fruit varieties in Iowa.
Fruit Var. hort. Dig. 1957 : **11** : 61–62.

The article deals chiefly with the apples Sharon (McIntosh x Longfield), Secor (Salome x Jonathan), Joan (Anisim x Jonathan) and Jonadel (Jonathan x Delicious).

4606 Kravčenko, L. M.
(A hybrid between apple and pear).
Nauk. Zap. Umans'k. ped. Inst. (Sci. Rep. Umans'k. ped. Inst.) 1956 : **3** : 69–72. [From Ref. Ž. (Ref. J.) 1957 : No. 23 : p. 24. (Abst.)]. [Ukrainian].

As a result of fertilization of the apple Stettin Red by self pollen + pollen of Clapp's Favourite pear, a single pear-shaped fruit with one seed was obtained. A weak seedling raised from this died in the second year.

4607 Zielinski, Q. B.
A survey of new early-coloring red sports of Delicious apples.
Fruit Var. hort. Dig. 1957 : **11** : 39–42.

Information is given on the fruit and tree characteristics of 28 red sports.

4608 Zaec, V. K. & Ivanova, Z. I.
(Some methods of directed training of hybrid apple seedlings).
Agrobiologija (Agrobiology) 1957 : No. **6** : 120–21. [Russian].

A higher proportion of plants with cultivated characteristics was obtained among the progeny of some apple hybrids at Mičurinsk by the following methods: (1) the hybrids were budded by identical hybrids, and (2) the hybrids were grown on soil rich in organic and mineral fertilizers until they came into bearing.

4609 Sokolova, E. P. & Žalnin, V. S.
(The question of the effect of the age of the flower upon the hybrid progeny of the apple).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **114** : 429–30. [Russian].

Immature, mature and old flowers of Pepin Šafrannyj [Saffron Pippin] were fertilized by the pollen of *Malus niedzwietzkyana*, which is characterized by red pigmentation. Analyses of the F_1 from each kind of pollination showed that a greater number of red-pigmented plants arose from fertilizations of immature and old flowers than from mature flowers. It is concluded that pollination of immature or old flowers weakens the maternal inheritance and promotes the development of the characters of the pollen parent.

4610 Péterfi, Ş., Brugovitzky, E. & Nagy Tóth, F.
Contribuţii la cunoaşterea soiurilor de mere din Ardeal. **(Contributions to knowledge of the apple varieties of Transylvania).**
Stud. Cercet. Biol., Cluj 1957 : **8** : 159–77.

Short descriptions are given of 87 varieties grown in Transylvania and data are added on the content of ascorbic acid, sugar, acids and dry matter in the fruits. Many of the varieties are old, locally adapted forms and are believed to be of value in breeding on account of their adaptation to montane conditions.

4611 Tihonov, N. P.
(Horticulture in the Korean People's Democratic Republic).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : 68–69. [Russian].

Three Korean apple varieties, which are thought to be worth introducing in the Soviet Far East, are briefly described. Honok and Vegum are high yielding early varieties with large fruit and flesh of good flavour. Kukvan is a late variety, characterized by pleasant flavour, good transportability and resistance to pests and diseases; it keeps for 7–8 months and produces high, regular, annual yields.

4612 Klein, L. G. & Einset, J.
Newer dessert apples.
Fruit Var. hort. Dig. 1957 : **12** : p. 18.

The following are showing promise at the New York Agricultural Experiment Station: Mantet (open-pollinated seedling of Tetofsky), an early apple from Canada; Puritan (McIntosh x Red Astrachan), not equal to Early McIntosh in quality but with larger fruits; Barry (McIntosh x Cox's Orange Pippin) [cf. XXVII, **4353**]; Vance Delicious and Bridgham Delicious, two colour sports; Franklin (McIntosh x Delicious) [cf. XXII, 2950–1]; Spartan (McIntosh x Yellow Newtown); and Melrose (Jonathan x Delicious) [cf. XVI, 1597].

4613 Hegwood, M. P. & Hough, L. F.
A mosaic pattern of chromosome numbers in the White Winter Pearmain apple and six of its seedlings.
Amer. J. Bot. 1958 : **45** : 349–54.

Hegwood, M. P.
A cytological study of selected trees of the apple progeny, Gallia Beauty x White Winter Pearmain.
Diss. Abstr. 1957 : **17** : Publ. No. 22,521 : p. 2131. (Abst.).

Dwarf seedlings from a cross between the diploid varieties Gallia Beauty and White Winter Pearmain proved to be diploid. A vigorous seedling (Jerseyred) from the same cross is a triploid. White Winter Pearmain and all the above-mentioned seedlings were characterized by hyperploid and hypoploid variation in chromosome number, occurring at random in the somatic tissues. The mitotic abnormalities observed may account for this variation.

4614 NYBOM, N.
Försök med äpplemust vid Balsgård. (**Experiments on apple juice at Balsgård**).
Frukt i år 1957 : 55–67.

Data on the yield of juice per fresh weight and dry matter, acid content, pH, colour, ascorbic acid content, flavour and aroma of the juice of 20 apple varieties are presented and discussed. Filippa, Dronning Louise [Queen Louise] and Laxton's Superb were judged best in quality.

4615 TORFASON, W. E.
A progress report to the Nutrition and Chlorosis Committee.
Rep. Proc. 13th annu. Mtg. West Canad. Soc. Hort., Regina, Sask. 1957 : p. 6.

Several thousand seedlings of crab-apple varieties were tested for resistance to lime-induced chlorosis at Lethbridge, Alberta. The varieties whose progenies showed least incidence of chlorosis were Bedford and Dolgo.

4616 CUMMING, W. A.
Progress report on the selection of chlorosis resistant clonal rootstocks of *Malus* at the Dominion Experimental Farm, Morden, Man.
Rep. Proc. 13th annu. Mtg. West Canad. Soc. Hort., Regina, Sask. 1957 : 7–8.

Nearly 7000 seedlings of varieties of *Malus* spp. were tested for resistance to lime-induced chlorosis. Varieties differed widely in the extent to which their progeny showed chlorotic symptoms, the least susceptible being the progeny of Jesim (82% healthy plants on chlorosis-inducing soil).

4617 RUSSELL, W. A.
Selection of chlorosis resistant apple seedlings.
Rep. Proc. 13th annu. Mtg. West Canad. Soc. Hort., Regina, Sask. 1957 : 8–9.

Notes are provided on the incidence of lime-induced chlorosis among the progenies of four controlled *Malus* crosses and of a series of open-pollinated *Malus* varieties at Indian Head, Sask.

4618 PISEK, A.
Versuche zur Frostresistenzprüfung von Rinde, Winterknospen und Blüten einiger Arten von Obsthölzern. (**Experiments on testing the frost resistance of the cortex, winter buds and flowers of some species of fruit tree**).
Gartenbauwiss. 1958 : **23** : 54–74.

These studies were carried out in the north Tyrol and included some apple varieties, a cherry and an apricot. The frost resistance showed in each case marked fluctuations throughout the year. The cortical tissues in Bohnapfel [Wax apple] and Boskoop were in general more resistant than those of Baumanns Renette but in early spring the resistance of the cortical tissues of Boskoop fell more rapidly than those of the other two varieties and during this period Boskoop was susceptible to frost.

Rudimentary flowers and leaves in the winter buds were more susceptible than the cortex and in the mature gynecium no varietal differences in resistance were distinguished. Resistance to frost appeared to be greatly influenced by various external conditions and it can only be considered as a varietal character in the sense of a reaction norm.

4619 JAKIMOV, E. S.
(**Some results of varietal studies of the apple and pear**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : 43–46. [Russian].

Descriptions are given of four small-fruited apple varieties which proved productive and winter hardy in Kazahstan. Among the pears, only some seedlings of *Pyrus ussuriensis* were sufficiently hardy; they had fruit of fair flavour.

4620 LISAVENKO, M. A.
(**Pepinka Altajskaja**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : p. 67. [Russian].

Pepinka Altajskaja [Altaj Pippin] (Renetka Purpurovaja [Purple Reinette] x Pepin Šafrannyj [Saffron Pippin]) was bred at the Altaj Horticultural Research Station. It is hardy, comes into bearing early and produces high, regular, annual yields. The fruits weigh 28–30 g., have a fair flavour and keep for 30–45 days.

4621 TARANOVA, E. A.
(**The inheritance of winter hardiness in hybrid apple seedlings**).
Latv. PSR Zinãt. Akad. Vestis 1957 : No. 8 : 57–62. [Russian].

Osennee Polosatoe [Autumn Striped], Belyj Naliv [White Juice], Wealthy, Sejanec Trebu [Trebu seedling] and Antonovka 600 g. were the hardiest among the varieties tested in Latvia, and as many as 53·08% of the progeny from crosses between these varieties showed no winter injury. The crosses of the above varieties with nonhardy varieties such as Pepin Litovskij [Lithuanian Pippin] gave 12·5% hardy progeny and those of nonhardy x nonhardy only 1·06%.

4622 Schander, H.

Untersuchungen zur Entwicklung von Frühselektionsmethoden für die Apfelzüchtung. II. Über Frühselektion auf Resistenz gegen Apfelmehltau (*Podosphaera leucotricha* Salm.), über die Anfälligkeit von Apfelsorten und über die Vererbung der Anfälligkeit. [**Investigations on the development of early selection methods for apple breeding. II. Early selection for resistance against powdery mildew (*P. leucotricha* Salm.), the susceptibility of apple varieties and the inheritance of susceptibility**].

Züchter 1958 : **28** : 105–32.

Three-year old seedlings from 22 crosses and fruit-bearing trees of 156 apple varieties were studied with reference to their susceptibility to *P. leucotricha* at Jork. Varietal characters were more important than external factors in determining the intensity of attack by *P. leucotricha*; variation within varieties as regards susceptibility was greatest for the least resistant types, these being most influenced by the environment. Data on the susceptibility of the varieties studied are tabulated, information also being given on their pedigree and place of origin; for some of the varieties only a small number of trees were available and so it was difficult to compare these with the rest of the varieties. Rootstocks did not have a marked effect on susceptibility to powdery mildew.

Amongst the hybrids, the percentage of seedlings attacked varied according to the susceptibility of the parents. Resistant varieties such as Golden Delicious, James Grieve, Melba and Glockenapfel [Bell apple] had most resistant progeny. Some reciprocal crosses showed that the female parent has a greater influence on the susceptibility of the progeny than the male parent; this effect varies according to the differences between the parents. It was concluded that early selection of seedlings for resistance would be possible and worthwhile.

Twelve families of related varieties were present in the collection investigated; it was found that in general varieties reacted to powdery mildew in a manner similar to that of the types from which they were descended. These studies did not indicate that either susceptibility or resistance was a dominant character. It is stated that they did show that Delicious, Golden Delicious, Wealthy and Worcester Pearmain transmit resistance characters to their progeny and Klarapfel [Clear apple] and McIntosh bequeath low susceptibility. Mutant forms had a similar reaction to that of normal forms of the same variety indicating that there was no pleiotropy between colour of fruit skin and resistance. No general differences were found between diploids and triploids in respect of resistance; susceptible and resistant triploid varieties were observed.

The author gives a detailed survey of the literature on the biology of *P. leucotricha* and of studies on the resistance of apple species and varieties. It was concluded that whereas the resistance of some varieties is relatively stable, in others, fluctuations occur which may be related to incomplete adaptation to the environment. The importance of considering adaptation to the conditions of cultivation, when breeding resistant varieties, is stressed. The literature also indicated that resistance is a complex character controlled by many genes; any relation between quality and resistance characters was considered to be unlikely.

4623 Williams, E. B. & Shay, J. R.

The relationship of genes for pathogenicity and certain other characters in *Venturia inaequalis* (Cke.) Wint.

Genetics 1957 : **42** : 704–11.

The following genes were investigated with respect to linkage: *p–8*$^+$, *p–9*$^+$, *p–10*$^+$ and *p–11*$^+$ controlling pathogenicity in races 1, 2 and 3 [XXVI, 3692]; *p–12*$^+$ and *p–13*$^+$ for reduced virulence against *Malus sikkimensis*; *gr*$^+$/*gr* for brown-olivaceous *vs.* bottle-green mycelium; and *mt*$^+$/*mt*$^-$ for mating type. Loose linkage was detected between *p–12*$^+$, *p–8*$^+$ for pathogenicity against *M. baccata* 'Dolgo', *p–9*$^+$ for pathogenicity against *M. pumila* 'R12740–7A', and the centromere. All other genes were inherited independently of one another and of the respective centromeres.

4624 Lamey, H. H., Boone, D. M. & Keitt, G. W.

***Venturia inaequalis* (Cke.) Wint. X. Growth responses of biochemical mutants.**

Amer. J. Bot. 1956 : **43** : 828–34.

The respective deficiencies of nine induced mutants for choline, pantothenic acid, nicotinic acid, inositol, pyrimidine, purine, arginine, histidine and reduced sulphur were complete, whereas the respective requirements of three mutants for biotin, riboflavin and methionine appeared to be partial. This behaviour is briefly discussed with reference to host-parasite relationships.

4625 Mori, H.
(Varietal differences in apples with regard to infestation by the red spider mite *Metatetranychus ulmi* Koch).
Hokkaido Daigaku Nogakugu Hobun Kiyo/Mem. Fac. Agric. Hokkaido Univ. 1956 : **2** : No. 4 : 118–22. [Japanese].

A comparative trial of six varieties showed that the American introduction McIntosh suffered least infection.

4626 Vysockij, A. A.
(Local pear varieties—horticultural resources).
Priroda (Nature), Leningrad 1958 : No. 2 : 108–10. [Russian].

A general description is given of local forms selected in the region of Trubčevsk. The majority are hardy, vigorous and long-lived trees productive of high quality fruit in most years. They differ with regard to maturation, early ripening forms keeping for 12–25 days and others from 1–4 months.

4627 Dowrick, G. J.
Abnormal gametogenesis and embryo abortion in the pear variety Beurré Bedford (*Pyrus communis*).
Z. VererbLehre 1958 : **89** : 80–93.

It was found that owing to failure of cell-wall formation after meiosis, the young pollen grains of Beurré Bedford had four nuclei. At the first pollen-grain mitosis, the four spindles fused in 81·4% of the pollen grains; in other cases one or more nuclei remained free, giving rise to haploid, diploid or triploid nuclei. In crosses with diploid and tetraploid female parents, Beurré Bedford yielded a preponderance of diploid and tetraploid progeny respectively, most of the embryos with chromosome numbers dissimilar to that of the female parent aborting before maturity. It is thought that abortion of the embryos is controlled by the balance between the number of chromosome sets of the male and female sex nuclei. Embryo sac development is normal in Beurré Bedford and the egg cells are haploid.

4628 Ridé, M. & Sutie, D.
Un dessèchement des pousses de poirier d'origine bactérienne. **(A pear-shoot wilt of bacterial origin).**
CR Acad. Agric. Fr. 1958 : **44** : 384–87.

This disease, studied in Sologne, is thought to be caused by *Pseudomonas syringae*. The reactions of seven pear varieties to the pathogen are recorded but further investigations are necessary to determine whether susceptibility is related to physiological condition or whether true varietal differences exist.

4629 Drain, B. D.
Fire blight resistant pears in the south.
Fruit Var. hort. Dig. 1957 : **12** : 23–24.

Morgan and Carrick, ripening in September, have been released from the Tennessee Agricultural Experiment Station. Morgan is a large yellow pear, suitable for dessert and canning, and possessing many of the characters of its parent Bartlett. Carrick (Seckel x Garber) bears fruit with good dessert quality and described as rusty red. Other fire-blight resistant varieties recently developed at the station comprise Dabney, Ayres, Mooers and Hoskins [cf. XXIV, 3291].

4630 Crescimanno, F. G.
Ricerche sulla biologia fiorale del nespolo del giappone. **(Investigations on the floral biology of the loquat).**
Riv. Ortoflorofruttic. ital. 1958 : **83** : 107–20.

Bags made of Calicut gauze were found suitable for bagging *Eriobotrya japonica* in the Palermo province of Sicily. No serious floral anomalies were observed in any of the 14 cultivars studied, all of which produced pollen of high germinating capacity. Certain cultivars varied widely from year to year in the amount of fruit set by self pollination; for instance Nespolone gigante bianco [Giant White loquat] set 0% the first year, 16·5% the second and 1·34% the third when bagged and 4·2, 12 and 21·71% when open pollinated; when pollinated with the varieties Rosa precoce [Early Pink] and Rosa tardivo [Late Pink], the sets were 60 and 55% in the second and third years respectively. Although the sets from selfing were lower than those from cross pollination, most of the varieties set sufficient fruit to be considered self compatible for practical purposes. Some valuable cultivars, such as Nespolone di Trabia [Giant Trabia loquat], Nespolone rosa tardivo [Giant Late Pink loquat] and Nespolone di Ficarazzi [Giant Ficarazzi loquat], benefited from cross pollination however and suitable pollinators are suggested.

4631 Crescimanno, F. G.
Le nespole primo frutto di primavera. **(The loquat, first fruit of spring).**
G. Agric. 1958 : **68** : 195–96.

Information is provided on the fruit characters and pollination requirements of a series of Italian varieties and a brief allusion is made to selection work on this species at Palermo [cf. XXV, 486].

4632 RJABOV, I. N. & KOSTINA, K. F.
(The achievements in breeding stone fruit trees at the Nikita Botanical Garden).
Agrobiologija (Agrobiology) 1957 : No. 5 : 41–54. [Russian].

This report on breeding work carried out in the Crimea includes descriptions of many new varieties of stone fruits referred to below as well as some interspecific and intergeneric hybrids thought to have economic value.

Apricot. Hardy late-flowering varieties were obtained by crossing late small-fruited apricots from Central Asia with European or Irano-Caucasian varieties. These produced average or higher than average yields in seasons when the standards bore no fruit at all. Mention is made of plum-apricot hybrids resistant to *Clasterosporium* and grey rot.

Plum. Midseason varieties of prunes, gages and myrobalan have been bred, also late-ripening prunes. Hybrids of *Prunus salicina* which are moderate in climatic and soil requirements and have a low percentage of aborted fruits have been obtained by fertilizing this species with mixed pollen from several varieties of *P. cerasifera* var. *taurica.*

Sweet cherry. Early and midseason white-fleshed canning varieties have been bred, also varieties differing in maturation period.

Peach. High-quality canning varieties and early and late dessert varieties have been developed. Forms adapted to the climatic and soil conditions of the steppe have been obtained by crossing hybrids of *Amygdalus nana* x peach to peach. Some varieties obtained by this method, for instance Pušistyj Rozovyj [Downy Pink], are resistant to *Clasterosporium.*

4633 JUSUBOV, A. M.
(The viability of apricot seed).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : 58–59. [Russian].

Stratified stones of Triumf Severnyj [Northern Triumph] and other varieties were subjected to temperatures of 0 to – 3° C. for periods of 10 to 80 days at Voronež. This treatment improved viability, rate of growth and the height and diameter of the seedlings. Minor varietal differences in these respects were noted.

4634 ENIKEEV, H. K.
(The breeding of plum and sour cherry in the USSR).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 75–82. [Russian].

Breeding research, together with the methods and material employed in the last two decades, is discussed. The practical achievements in plum breeding include high-quality prunes from the Nikita Botanical Garden, prunes and canning plums rich in sugar from Central Asia, *Prunus ussuriensis* seedlings and hybrids of the latter with Chinese-American hybrid plums from the Far East combining hardiness with fine fruit quality, and productive hardy varieties of fine quality from Mičurinsk, Moscow and Kujbyšev. Many varieties of sour cherry are mentioned for high yield, large fruit, fine flavour and some for winter hardiness. The hardiest varieties were obtained by crossing Central Russian varieties with those derived from *P. fruticosa.* It was found that crosses between sour cherry ($2n = 32$) and sweet cherry ($2n = 16$) give rise to a high percentage of sterile progeny with 24 chromosomes, but fertile hybrids with 32 chromosomes and in some cases with 23 chromosomes have been obtained at Mičurinsk, Kujbyšev, Moscow and in White Russia.

4635 **(The plum varieties Pamjat' Timirjazeva and Iskra).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 3 : 57–58. [Russian].

Pamjat' Timirjazeva [Timirjazev's Memorial] and Iskra [Spark], both from Victoria x Skorospelka Krasnaja [Red Early], were bred at the Moscow Horticultural Research Station. They produce better quality fruit than Skorospelka Krasnaja but are almost as hardy. Pamjat' Timirjazeva has larger fruit than Iskra, but the latter is the more productive of the two.

4636 WERNECK, H. L.
Die Formenkreise der bodenständigen Pflaumen in Oberösterreich. Ihre Bedeutung für die Systematik und die Wirtschaft der Gegenwart. **(Types of indigenous plums in Upper Austria. Their significance for classification and present-day economy).**
Mitt. Klosterneuburg : Ser. B. : 1958 : **8** : 59–82.

Descriptions are provided of a series of primitive races of *Prunus spinosa*, *P. domestica*, *P. cerasifera* and *Amygdalus nana* from Upper Austria. A revised classification of subspecies and varieties of *P. domestica* is suggested. It is thought that Upper Austria was a centre of origin for types of *P. domestica* which probably arose from hybridization between *P. spinosa* and *P. cerasifera.* Many of the plums described are thought to be useful for breeding purposes. They give consistently high yields at altitudes up to 850 m. and are resistant to frost; some of the races would make good rootstocks and others produce fruit suitable for distilling spirits.

4637 Jordović, M.
Ispitivanje šarke na šljivi. Dejstvo Prunus virus 7 (Hristov) na lišće nekih sorata šljiva. [**A study of *Prunus* virus 7. The effect of *Prunus* virus 7 (Hristov) on the leaves of some plum varieties**].
Zaštita Bilja 1957 : No. 39–40 : 13–22.

Metlaš and Magna glauca [Large Glaucous] were the most tolerant of the virus among the plum varieties tested at Čačak, but none was resistant. Varietal differences with regard to symptoms are noted.

4638 Videnov, B.
(**The present state of the problem of *Prunus* virus 7**).
Selskostopan. Misăl 1957 : No. 9 : 539–543. [Bulgarian].

Breeding work with plums, aiming at developing varieties combining the flavour of Kjustendilska Sinja [Kjustendil Blue] with resistance to *Prunus* virus 7 and red spot, is reported from Sofia, Kjustendil, Drjanovo and Trojan. Hybrids which have so far shown the desired characters were obtained from pollinations of Kjustendilska Sinja by Sakarka, Pribojka, Ranna Bjulerova [Bjulerov's Early] and other land varieties resistant to the above diseases.

4639 Kedrin, S. P.
(**E. P. Finaev, a breeder from the Volga basin**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : 65–66. [Russian].

Zarja Povolž'ja [Dawn over the Volga], Desertnaja Volžskaja [Volga Dessert] and some other new sour-cherry varieties were bred by Finaev at Kujbyšev; most were obtained from crosses of Krasa Severa [Beauty of the North] with Vladimirskaja. They ripen early and are hardy and productive of high quality fruit. Mention is also made of large-fruited hardy dessert varieties of plum such as Družba [Friendship], Uspeh [Success] and several others. Most are hybrids between hardy local forms of damson or large-fruited sloe and high quality plums of various origins.

4640 Bolotskij, Ju. S.
(**Experimental research with *Prunus fruticosa* in Burjat-Mongolia**).
Agrobiologija (Agrobiology) 1957 : No. 6 : 138–40. [Russian].

P. fruticosa is regarded as more suitable breeding material than *P. besseyi*, mainly on account of its greater winter hardiness. In experiments at Ulan-Ude, it was pollinated by a series of sour-cherry varieties. In most cases pollination improved the fruit set, and the size and sugar content of the fruit; differences in these effects resulting from different pollen parents are noted.

4641 Hłyń, M.
Wpływ mieszanin pyłkowych na uzyskanie mieszańców. (**The influence of pollen mixtures on the productivity of the hybrids**).
Arbor. Kórnickie 1956 : **2** : 247–57.

The cherry varieties Dragana Żółta [Yellow Dragan] and Lionska [Lyons] were pollinated with pollen from *Cerasus vulgaris*, *C. subhirtella*, *C. incisa*, *C. avium*, apricot, peach and almond and with pollen mixtures of *Cerasus* spp. or a *Cerasus* sp. + another genus. Details of the leaf morphology of some of the resulting hybrids are given.

4642 Teterev, F. K.
(**Some results of breeding fruit trees in the USSR**).
Agrobiologija (Agrobiology) 1957 : No. 6 : 61–67. [Russian].

This brief review of breeding research covers a period of 40 years. In particular, sour-cherry varieties bred by the writer and his colleagues at Leningrad are mentioned. They are characterized by high yield, hardiness and fine quality. The best of them is Leningradskaja Skorospelka [Leningrad Early], which has better flavour than Šubinka, Vladimir and Krasnyj Pahar' and ripens a month earlier.

4643 Lecrenier, A.
La Station de Recherches de l'État pour l'Amélioration des Plantes fruitières et maraîchères, à Gembloux. (**The State Research Station for the Improvement of Fruit and Market Garden Crops at Gembloux.**)
Rev. Agric., Brux 1958 : **11** : 446–48.

Forms of Quetsche d'Allemagne and of the cherry variety Griotte commune [Common morello] are being studied and also descriptions of other plums and cherries are being prepared for publication. Mention is made of the breeding of soft fruits and vegetables.

4644 Danilov, A. D. & Sinel'ščikov, R. G.
(**Wild sweet cherry in the forests of the North Osetian ASSR**).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 262–66. [Russian].

Two forms occur, one with dark brown and the other with light silvery bark. Both have proved resistant to most pests and diseases but the two forms differ in vigour, yield, longevity, tendency to gum production and a number of ecological reactions. The dark form is the more vigorous but more prone to gumming.

4645 Verner, L.
Procedure for determining resistance of sweet cherry varieties to fruit cracking.
Fruit Var. hort. Dig. 1957 : **12** : 3–4.

A standard laboratory procedure for testing varietal susceptibility to cracking is described. The method is based on submersion of the fruits in water.

4646 Čerevatenko, A. S.
(**New varieties of Inžirnyj peaches**).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **3** : 56–57. [Russian].

The above kind of peach, originating from China or Java, is probably so-called from the shape of its fruit, which resembles a dried fig. In Uzbekistan this type, especially the variety Kyzyl Inžir Šaftali is rated highly for its productiveness, large fruit and fine flavour. Its defects are clinging stones, tender skin and unattractive off-white flesh colour. New varieties, mostly with yellow flesh and free stones, have been bred at Samarkand. Descriptions are given of Vladimir, Širin, Inžirnyj Novyj [New Fig] and Medovyj [Honey], all of them hybrids between the Inžirnyj type and varieties with round or oval fruits. They are dessert varieties but the first two may be used for canning or preparation of dried fruit.

4647 Steyn, P. A. L.
New, early-ripening canning peach.
Fmg. in S. Afr. 1958 : **34** : No. **1** : 50–51.

Developed at the Western Province Fruit Research Station, Stellenbosch, Walgant is a yellow clingstone type which ripens earlier than Keimoes and Kakamas and shows good resistance to delayed foliation. It originated as a selfed seedling of Kakamas.

4648 Evreinoff, V.-A.
Notes sur les ancêtres des pêchers cultivés. (**Notes on the ancestors of cultivated peaches**).
Ann. Éc. nat. supér. agron., Toulouse 1957 : **5** : 61–68.

Brief descriptions are provided of *Persica davidiana*, *P. mira*, *P. kansuensis*, *P. vulgaris* and *P. ferganensis*; all these species occur in China. Four groups of cultivated peaches are distinguished according to the classification originally proposed by Rjabov and notes are given on the characteristics of these groups and their subdivisions.

4649 Kitajima, H.
(**Methods for combating peach diseases. III**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 573–74. [Japanese].

Tabular data are provided on the resistance of Japanese varieties to *Gloeosporium laeticolor*, *Cladosporium carpophilum* and *Pseudomonas pruni*.

4650 Buddenhagen, I. W.
Induced mutations and variability in *Phytophthora cactorum*.
Amer. J. Bot. 1958 : **45** : 355–65.

A detailed account is given of investigations of which a brief report has already appeared elsewhere [1428].

4651 Lesley, J. W.
Peach breeding in southern California.
Fruit Var. hort. Dig. 1957 : **12** : 19–20.

Breeding varieties with lower requirements for winter chilling is outlined. The release of Tejon, developed at the University of California, is expected in 1959. This peach requires less winter chilling than Springtime [cf. XXV, 3364].

4652 Naithani, S. P. & Raghuvanshi, S. S.
Cytogenetical studies in the genus *Citrus*.
Nature, Lond. 1958 : **181** : 1406–07.

Evidence has been obtained that segmental interchange, as in *C. assamensis*, and inversion, as in *C. penivesculata* and *C. limonia* 'Italian Round', have played an important part in speciation. In contrast to Italian Round, however, the lemon Italian Oblong shows no bridge formation at anaphase. Cytomixis has been observed in *C. penivesculata*, in which partial or complete transference of the nucleus of one PMC to another may occur, a binucleate cell of normal size thus being formed. In addition, giant binucleate PMCs have been noted which apparently arise through the fusion of fully developed PMCs. Except for one cell with two separate metaphase I plates, each having a complement of 18 chromosomes, these giant cells have single syndiploid spindles.

4653 Mamporija, F. D.
(**The effect of the fertilizing element upon nucellar cells in citrus fruits**).
Agrobiologija (Agrobiology) 1957 : No. **5** : 119–31. [Russian].

Pollination of the Unshu (= Satsuma) mandarin and Washington Navel orange by the pollen of *Poncirus trifoliata* has given mostly nucellar seedlings and a few hybrids. In experiments where the above varieties and a lemon were pollinated by *Citrus ichangensis*, they produced some nucellar seedlings of a special kind, referred to as hybrid nucellar seedlings or vegetative nucellar hybrids. These differed from ordinary nucellar seedlings in having some morphological characters of the pollen parent. A table shows the modes of segregation of the normal hybrids, nucellar seedlings and hybrid nucellar seedlings. A number of hybrid nucellar seedlings, which are thought to possess breeding value, have been selected. In another experiment, the effect of pollen upon segregation among sexual and nucellar progenies in citranges was investigated. It was found that segregation occurs both among F_2 nucellar seedlings from selfing and from pollinations involving orange or *P. trifoliata*. Citranges were also pollinated with self pollen, or pollen from orange or *P. trifoliata*. The findings indicated that segregation was not controlled by reduction division and that nucellar progenies, as well as sexual progenies, segregated. Among a great diversity of forms thus obtained, some combine the hardiness of the wild species with good cultural characteristics.

4654 Moscoso, C. G.
The Puerto Rican chironja—new all-purpose citrus fruit.
Econ. Bot. 1958 : **12** : 87–94.

A description is given of the chironja, which was discovered growing wild in the mountains of Puerto Rico in 1956 and appears to be a natural hybrid between orange and grapefruit. It combines the flavours and other desirable characteristics of both putative parents. All the seedling trees so far studied have been true to type, evidence of development from nucellar embryos thus being given. Parent trees and progenies are being studied with respect to many characters. Three initial selections have been made among the wild trees.

4655 Sturiale, F.
L'arancio in Calabria. Nuovi orientamenti sul problema varietale. (**The orange in Calabria. New directions in the varietal question**).
Ital. agric. 1958 : **95** : 331–43.

In the section on varieties it is pointed out that in certain areas of southern Italy none of the newer cultivars can equal the local variety Biondo comune [Common Unpigmented] in regularity of yield and fruit quality. Descriptions are given of this and another unpigmented variety, Biondo ovale [Oval Unpigmented], which is resistant to attack by *Ceratitis capitata*. Another variety, Belladonna, has gained in popularity in recent years.
Three blood oranges recommended are Sanguinello [Little Blood Orange], Sanguigno [Blood Orange] and Moro [Mulberry].
All the cultivars described have proved superior to Washington Navel in yielding capacity.

4656 Frost, H. B., Cameron, J. W. & Soost, R. K.
Diversity among nucellar-seedling lines of Satsuma mandarin and differences from the parental old line.
Hilgardia 1957 : **27** : 201–22.

Extensive studies have been carried out at Berkeley, Calif., with two strains described previously [XXVII, 4383] and a third strain recently identified. Differences have been observed in respect of yield, tree size and habit, leaf size and fruit colour and quality. The differences are thought to be at least partly genetic. Both parental and nucellar lines have been free from tristeza and psorosis.

4657 Bianchedi, A.
Il gelso Kokusó sostituisce tutte le vecchie varietà? (**Is the Kokuso mulberry to replace all the old varieties?**).
G. Agric. 1958 : **68** : p. 110.

Bianchedi, A.
I gelsi giapponesi Kokusò. (**The Japanese Kokuso mulberries**).
Agric. bresciano 1958 : **6** : No. 21 : p. 2.

Further data are presented [cf. XXV, 3375] showing that the Japanese mulberry varieties Kokuso 20 [National mulberry 20], Kokuso 21 and Kokuso 27 come into leaf 5–6 days earlier than the Italian variety Morettini, yield 50–70% more leaf and are more vigorous and more efficient in healing after pruning.

4658 Polunina, N. N.
(**Data on the floral biology and embryology of *Feijoa***).
Bjull. Glavnogo Bot. Sada (Bull. Princ. Bot. Gdn.), Moskva-Leningrad 1957 : No. 29 : 60–71. [Russian].

Details are given of the morphology of the flower, fruit and seed of *F. sellowiana* and of the development of the ovules, embryo sac, pollen grains, embryos and endosperm. The chromosome number $n = 11$ was confirmed in the pollen mother cells.

4659 Oppenheimer [Openhimer], H.
(**New mango varieties in Israel**).
Sadeh (Field)/Hassadeh 1956 : **36** : 651–54. [Hebrew].

Some twenty varieties being grown in Israel are briefly described. They are classified primarily on the basis of fruit colour.

4660 KAWAGOE, H.
(Studies on the period during which the capacity for fertilization of the chestnut persists).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1955 : No. 53 : 141–54. [Japanese].

Cross-pollination experiments between the Japanese chestnut varieties Ginyose, as mother plant, and Akachu or Boji 360, as pollinators, are reported. The stigmas remained receptive for 1–40, or in the lateral flowers, 1–45 days; cross pollination was best effected 8–22 days after stigma emergence.

4661 PAHOMOVA, M. G.
(New finds of hybrids of *Amygdalus kalmykovii* O. Lincz.).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 569–71. [Russian].

In the hills round Taškent wild populations originally thought to represent *A. spinosissima* have displayed many features characteristic of *A. kalmykovii* and *A. communis*. Seedlings also revealed the influence of *A. communis* and it is concluded that hybridization has taken place between wild and cultivated forms.

4662 EVREINOFF, V.-A.
Contribution à l'étude de l'amandier. **(A contribution to the study of the almond).**
Ann. Éc. nat. supér. agron., Toulouse 1957 : **5** : 45–59.

After reviewing the literature on the origin of the cultivated almond, descriptions are provided of 14 wild species; it seems probable that at least some of these wild forms contributed towards the germ plasm of cultivated varieties. Some of these species have characters which would be valuable in breeding new varieties. Several pomological classifications of almonds are critically considered and it is thought that from the schemes of Boguševskij and Cuénot a useful classification of Mediterranean varieties could be made.

4663 DEL GAUDIO, S.
Ibridazione del mandorlo. **(Hybridization of the almond).**
Frutticoltura, Bologna 1958 : **20** : 145–55.

The characteristics are described of some of the 129 progeny obtained from 26 intervarietal crosses, made at the Bari Agricultural Experiment Station in 1949. Three interspecific hybrids between almond and peach have shown the greatest vigour and resemble the peach variety Hale, their male parent, more closely. Most of the progeny from intervarietal crosses were resistant to *Exoascus deformans* but progeny from almond x peach and almond x apricot were severely attacked. Mosaic symptoms were shown by 11 hybrids. Several of the plants bore fruit in 1956, one of the almond x apricot hybrids giving 18 fruits.

4664 MADHAVA RAO, V. N. & VAZIR HASSAN, M.
Preliminary studies on the floral biology of cashew (*Anacardium occidentale* Linn.).
Indian J. agric. Sci. 1957 : **27** : 277–88.

From observations made at Mangalore on 100 tagged shoots during the period from flowering to fruiting, information was gained on the flowering period, formation of the flowers, pollination and fruit set. About 96% of the flowers were found to be staminate and 4% were hermaphrodite; most of the latter appeared between 45 and 105 days after the commencement of flowering. The need for selection with respect to increased production of perfect flowers is emphasized and it is suggested that breeding for shorter style length and a lower ratio of style length to stamen length may help in securing a better fruit set by open pollination. Insects appeared to be unimportant in effecting pollination, wind being the principal pollinating agent.

4665 WHITEHOUSE, W. E.
The pistachio nut—a new crop for the western United States.
Econ. Bot. 1957 : **11** : 281–321.

Aspects dealt with in this survey on the production of *Pistacia vera* in different countries include the origin and history of the species, distribution and variation of wild pistachio in central Asia, commercial varieties and floral biology. Mention is made of the selections Kerman, Damghan and Lassen, developed in California and recommended for testing in other areas of the state.

4666 BUNTING, A. H.
A further note on the classification of cultivated groundnuts.
Emp. J. exp. Agric. 1958 : **26** : 254–58.

"Further studies in the central Sudan during the 1955–6 season extended and somewhat modified the general classification of cultivated groundnuts previously presented [XXVI, 2796]. The new observations deal with the subdivision of the alternately branched forms, particularly of the former Matevere group; with the status of certain varieties previously assigned to the Valencia group; and with resemblances between the groups. A few new groups have been added in the sequentially branched section, and some cases of anomalous branching are recorded."

[Author's summary].

4667 KUMAR, L. S. S. & D'CRUZ, R.
Aneuploidy in species hybrid of *Arachis*.
J. Indian Bot. Soc. 1957 : **36** : 545–47.

The F_1 hybrid ($2n = 30$) of *A. hypogaea* ($2n = 40$) x *A. villosa* var. *correntina* ($2n = 20$) was back crossed to the former species. Only one cross, in which *A. hypogaea* was the ♀ parent, was successful. The single, highly fertile plant thus obtained resembled *A. villosa* and the triploid parent in having a spreading habit, and *A. hypogaea* in being annual. It had $2n = 41$, $1_{III} + 19_{II}$ usually being observed at metaphase I.

4668 TÉTÉNYI, P.
Données sur la floraison de l'*Arachis hypogaea* L. en Hongrie. (**Data on the flowering of *A. hypogaea* L. in Hungary**).
Acta agron., Budapest 1958 : **7** : 387–98.

Time and abundance of flowering were affected by weather conditions, use of boron or phosphorus fertilizer sprays and by variety. Flowering was generally later in var. *procumbens* than in var. *fastigiata*, the latter producing more ripe fruits. Hybrids between the two varieties were intermediate in flowering time and fruit production. Of numerous cultivars within var. *fastigiata*, Stepniak [groundnut from the Steppe] produced most flowers and fruits, Negro Grande fewest and Valencia an intermediate number.

4669 FORTANIER, E. J.
De beïnvloeding van de bloei bij *Arachis hypogaea* L. (**The control of flowering in *A. hypogaea* L.**)
Meded. LandbHoogesch., Wageningen 1957 : **57** : 1–116.

Studies of the effects of light differing in intensity, duration and spectral composition, of varying day and night temperatures and of differences in humidity of soil and air upon germination, growth, flowering and fruiting in the variety Schwarz 21 are reported. Number of flowers formed was depressed by defoliation and by the presence of developing fruits and was promoted by removal of pegs and fruits. Initiation of flowers was independent of photoperiod or thermoperiod, being closely related to leaf formation, but opening of flowers and the total number of flowers formed were strongly affected by the environmental factors studied. Suitable treatments for the regulation of flowering at will are outlined.

4670 ZAMOTAJLOV, S. S.
(The question of partial sterility in *Arachis*).
Agrobiologija (Agrobiology) 1957 : No. 6 : 128–32. [Russian].

Cytoembryological examination of the variety VNIIMK 433 [Oil Plants Institute 433] at Krasnodar showed that most ovaries were partially sterile. Among 390 ovules investigated, 128 were sterile and of these 16 had morphological defects of various kinds. There was a definite connexion between sterility and the location of the ovule in the ovary. This was apparent from the lower proportion of fertilized ovules at the base of the ovary than in the apical region; morphologically defective ovules occurred more frequently at the base of the ovary too.

4671 KRAPOVICKAS, A. & RIGONI, V. A.
Nuevas especies de *Arachis* vinculadas al problema del origen del maní. (**New species of *Arachis* related to the problem of the origin of the groundnut**).
Darwiniana, B. Aires 1957 : **11** : 431–55.

Annual species found in north-western Argentina include *A. pusilla* ($2n = 20$) and the similar but more robust form *A. monticola* ($2n = 40$), described as a new species. Both show branching of the Virginia type. The latter has given fertile hybrids with *A. hypogaea* ($2n = 40$), to which it is regarded as more closely related than are the perennial species *A. pusilla* ($2n = 20$), *A. villosa* vars. *villosa* and *correntina* ($2n = 20$), *A villosulicarpa* ($2n = 20$) and *A. hagenbeckii* ($2n = 40$). Of these species only the *A. villosa* varieties could be crossed with *A. hypogaea*, giving sterile triploids. North-western Argentina is therefore regarded as a more probable centre of origin for the groundnut than central Brazil, where most of the perennial wild species occur.

Latin diagnoses of *A. monticola* and the perennial species *A. helodes* and *A. lutescens* are included, together with a detailed description of *A. pusilla*.

4672 LIYANAGE, D. V.
Annual report of the botanist for 1956.
Ceylon Cocon. Quart. 1957 : **8** : 34–41.

The yields given by the F_1 progeny of a number of *typica* x *nana* crosses are tabulated. Yields have been good and the progeny are as hardy as their *typica* parent and were unaffected by a drought which severely affected dwarf palms in the same block. Further *typica* x *typica* crosses have been made and seed nuts harvested from Dwarf x San Ramon, King Coconut x San Ramon, King Coconut x Tall and their reciprocal and from Tall x San Ramon. No correlation has been found between the yield of a mother palm and its offspring under open pollination, and variation in yield between the offspring in a single family was found to be considerable in all except the two highest yielding families.

A total of 43 correlations have been worked out between a number of seed, seedling and mature plant characters in a Latin-square selection experiment now in its seventeenth year. Those of economic importance are briefly mentioned.

4673 HARLAND, S. C.
The improvement of the coconut palm by breeding and selection.
Bull. Cocon. Res. Inst., Ceylon 1957 : No. 15 : Pp. 14.

Methods of selection and breeding are described, illustrated by results obtained at the Coconut Research Institute of Ceylon, and suggestions for future work are put forward.

4674 EL-ANI, A. S.
The genetics of *Ceratostomella radicicola* and the phylogenetic relationship between *Chalaropsis* and *Chalara*.
Amer. J. Bot. 1958 : **45** : 228–32.

It was found that the macroconidia-lacking mutants gray and tan of *C. radicicola* arose from the strains black and brown respectively by single gene mutations which suppressed the formation of macroconidia. The loss of macroconidia is equivalent to a change from the genus *Chalaropsis*, the imperfect stage of *C. radicicola*, to *Chalara*; in this connexion the evolutionary relationships of *Chalaropsis* and *Chalara* are discussed. The colour of protoperithecia, microconidia, and endoconidiophores is controlled by the gene determining colour of macroconidia and perithecia. Studies of crosses between the four strains showed that colour, compatibility and macroconidial formation segregate independently.

4675 **(The culture of the cornelian cherry in Kiev).**
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **3** : 55–56. [Russian].

Mention is made of forms selected for high yield and large fruit of high quality at the botanical garden in Kiev.

4676 LEDIN, R. B.
The Florida sweet Barbados cherry.
Fruit Var. hort. Dig. 1957 : **12** : 13–15.

Selection of clones of *Malpighia glabra* has been carried out at the Subtropical Experiment Station of the University of Florida. The best clone has been named Florida Sweet Barbados Cherry. Two-thirds of its large fruits can be extracted as juice, 100 g. of which contains 1500–2000 mg. of ascorbic acid. The semisweet fruits have an agreeable apple-like flavour and lack the tartness characteristic of the species. The skin is thicker and the flesh somewhat firmer than in other clones; the fruits are therefore less susceptible to stink-bug injury and bruising. Florida Sweet has outyielded all other selections.

4677 CHAMBERS, J. B.
Avocado varieties for commercial trial in the Rio Grande Valley.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 137–39.

Descriptions are given of the locally adapted varieties Pancho, Lula and Diaz. Other local varieties and numerous selections under trial are mentioned.

4678 ABRAMS, R., PENNOCK, W., JACKSON, G. C. & PÉREZ LÓPEZ, A.
Flower behaviour of different avocado varieties grown in Puerto Rico.
J. Agric. Univ. PR 1957 : **41** : 236–41.

The 118 varieties and selections studied were found to fall into two groups according to their pattern of flowering. In group A the flowers open in the morning as females, close at noon, and open again about 24 hours later, in the afternoon, as males, while in group B the flowers open first in the afternoon as females and reopen 12 or 36 hours later, in the morning, as males. The length of the closing period in group B is a varietal characteristic. This pattern of behaviour makes self pollination almost impossible and its relevance to the choice of varieties is emphasized.

4679 COOPER, W. C. & MAXWELL, N.
The search for avocado varieties adapted to the Rio Grande Valley.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 126–33.

An account is given of the various expeditions made into northern Mexico to collect avocado seedlings. The objectives were frost and anthracnose resistant forms. The most promising seedlings are of the Mexican or Mexican - West Indian types.

4680 MAXWELL, N. & COOPER, W. C.
Expeditions to northern Mexico during 1955 in search of avocado varieties.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 134–36.

An account is given of the plant-collecting activities of expeditions to Coahuila and Nuevo León, Mexico. The selections brought back were of the Mexican and Mexican - West Indian types. The chief objectives of the collection were seedlings showing frost or anthracnose resistance. [Cf. 4679].

4681 JINNO, T.
Cytogenetic and cytoecological studies on some Japanese species of *Rubus*. I. Chromosomes.
Shokubutsugaku Zasshi/Bot. Mag., Tokyo 1958 : **71** : 15–22. [Japanese].

R. japonicus of subgenus *Cylactis*, *R. ribisoideus* and *R. trifidus* of subgenus *Anoplobatus* and 16 species belonging to subgenus *Idaeobatus* had $2n = 14$. In *R. pectinellus* of subgenus *Chamaebatus*, $2n = 42$. The following numbers are reported for species in subgenus *Malachobatus*: *R. sieboldi*, $2n = 28$; *R. hakonensis*, $2n = 42$ and 56; *R. buergeri* and *R. pseudo-sieboldii*, $2n = 56$. Bivalents and occasional quadrivalents were formed at metaphase I in *R. pseudo-sieboldii*; the possible hybrid origin of this species is discussed. In two cultivated varieties of *R. fruticosus*, $13_{II} + 2_{I}$ or 14_{II} were usually observed. A cultivated type of blackberry had $2n = 49$ and formed $21_{II} + 7_{I}$.

4682 BRITTON, D. M. & HULL, J. W.
Chromosome numbers of *Rubus*.
Fruit Var. hort. Dig. 1957 : **11** : 58–60.

Various difficulties affecting the reliability of information on chromosome numbers in *Rubus* are pointed out. A table listing the $2n$ numbers of 50 species and varieties examined by the authors is given.

4683 HULL, J. W. & BRITTON, D. M.
Development of colchicine-induced and natural polyploid breeding lines in the genus *Rubus* (Tourn.) L.
Bull. Md. agric. Exp. Sta. 1958 : No. A–91 : Pp. 63.

Mention is made of polyploid forms of *Rubus* naturally occurring in the USA and the literature on breeding polyploid *Rubus* is surveyed. Several methods of colchicine treatment were investigated and it was found that colchicine was only effective in inducing polyploidy on relatively undifferentiated shoot meristems; a number of polyploid blackberries and raspberries were obtained by treating germinating seed at the cracked seed coat stage with 0·2% colchicine in 5% glucose solution at 86° F. for nine hours. Even with this method, there was a high mortality rate and it was necessary to work with large populations of plants. Screening for polyploids could be effected at an early stage of seedling growth [cf. XXVII, 4432]. Most of the polyploids were chimeras of tissues with doubled and nondoubled chromosome numbers, and most had root systems with nondoubled chromosome numbers. It was possible to eliminate nonpolyploid stems on the basis of foliage characteristics which were specific for the different levels of polyploidy in derivatives from the second histogenic layer. Fruit size varied directly with the ploidy of the third histogenic layer in otherwise comparable plants. The octoploids were on the whole sterile whereas many $4x$ and $6x$ plants were fertile; this was true for blackberries and raspberries. However one $8x$ seedling of open pollinated US1465 was particularly vigorous and after heavy flowering in the second season, 60 per cent. of the potential drupelets were set both by selfing and with pollen of Austin Thornless ($8x$). Meiotic irregularities and polyspory were general in all the induced polyploids examined. A range of chromosome numbers was found in seedlings of $8x$ Eldorado selfed. Male gametes of low chromosome number seemed to be favoured in effecting fertilization. Selections of high fertility were made from $4x$ and $6x$ black and red raspberries, blackberries and *R. parvifolius* and from hybrids between raspberry and *R. parvifolius* and between raspberry and blackberry. It is thought that some of these lines and particularly the tetraploids will be useful as breeding lines in their own right and for hybridization with high polyploid blackberries.

Hardy erect Logan-type blackberry x raspberry hybrids could be obtained by making the cross at the natural level of ploidy and then doubling the chromosomes of the F_1 hybrid. For example tetraploid Eldorado was crossed with the diploid raspberry Oregon 913 and a vigorous and fertile hexaploid was obtained by colchicine treatment. Although neither parent was large fruited, the berries of the hexaploid were larger than those of tetraploid hybrids obtained by other workers. Also the fruit of the hexaploid could be separated easily from their stalks as is the case with blackberry fruit; this may have been due to unequal balance of blackberry and raspberry genomes but in one cross of Hailsham ($4x$) red raspberry x Austin Thornless ($8x$) blackberry, the raspberry-like separation of the fruit indicated that there may be some other genetic control of this character.

Mitotic instability in *Rubus* has already been referred to [XXVII, 2213 and 4431]. The widespread occurrence of this instability amongst the polyploids presents certain difficulties in maintaining desirable breeding lines and the genetic contribution of unstable parents in hybridization is unpredictable. Mitotic instability is evident at or above the $6x$ level of ploidy.

In some cases seedlings arose from fertilized unreduced female gametes or from reduced unfertilized female gametes. This made it possible to effect combinations which could not be brought about by using high colchicine-induced polyploids. For example, it was not possible to cross $8x$ Hailsham with $4x$ *R. parvifolius* on account of the sterility of octoploid Hailsham. A $6x$ seedling was found in a hybrid population of Hailsham ($4x$) x $4x$ *R. parvifolius*; the seedling had hybrid characters and was thought to have resulted from the fertilization of an unreduced female gamete of Hailsham. It is considered that $6x$ seedlings of Eldorado ($4x$) selfed, apparently originating from unreduced female gametes, may be suitable for hybridization with the polyploid western trailing blackberries ($6x$ to $12x$).

The inheritance of partially dominant thornlessness from Austin Thornless blackberry was found to be complex, although thornlessness could be transferred from this source to the F_1 hybrids from crosses with many types of *Rubus* at various levels of ploidy. Eldorado also contributed thornlessness to some of its F_2 progeny. Amongst five seedlings resulting from the pollination of a single Thornless Logan flower with pollen from $8x$ Eldorado, one seedling appeared to be a hybrid and thornless; unlike the parent, thornlessness was also found on root suckers. A possible explanation involving pseudogamy is suggested for the origin of this seedling.

4684 Gran, Ž. [Grand, J.].
(The selection of hybrid seedlings between dewberry and raspberry).
Agrobiologija (Agrobiology) 1957 : No. 6 : 149–53. [Russian].

This article deals mainly with the morphological characteristics of pure species and hybrids of *Rubus*, from which their economic value can be assessed at an early stage. A brief mention is made of the writer's hybrid between *R. idaeus* and *R. fruticosus*, obtained by the use of vegetative rapprochement in France. In 1956 it bore flowers which resembled *R. fruticosus*; other characters were intermediate.

4685 Swales, T.
"151" raspberry to be known as "Creston".
Fruit Var. hort. Dig. 1957 : **12** : p. 9.

A red raspberry of unknown origin and referred to locally as 151 has become popular in the Creston Valley, British Columbia. It has accordingly been named Creston 151. It is at least as hardy as Latham and apparently tolerant of mosaic. The fruits are much more attractive in appearance than those of Latham and Newburgh, are suitable for transporting, canning and freezing, and ripen uniformly.

4686 **What is new in blackberry breeding program at OSC.**
Bett. Fruit 1958 : **52** : No. 8 : 10, 19.

Information is given on experimental selections which have been developed at Oregon State College and which show improvements over the present commercial varieties.

4687 Klämbt, H. D.
Untersuchungen über die Befruchtungsverhältnisse bei Schwarzen und Roten Johannisbeeren. **(Investigations on fertilization relationships in black and red currants).**
Gartenbauwiss. 1958 : **23** : 9–28.

Four black-currant varieties were studied and it was found that Silvergieters Zwarte [Silvergieter's Black] and Goliath were self fertile whilst Rosenthals Langtraubige [Rosenthal's Long-clustered] and Boskoop Giant were partially self sterile. The red-currant varieties Heros, Rote Holländer [Red Dutchman], Rote Vierländer [Red Vierländer] and Heinemanns Spätlese [Heinemann's Late Harvest] were all partially self sterile to about the same degree. Self incompatibility was not due to inhibition of pollen-tube growth in either the black or red currants but rather to the low number of ovules which developed normally after fertilization. This slow development of the seed may be the cause of fruit drop.

Experiments are also described indicating that, under natural conditions, self pollination predominates in black currants, whereas in red currants cross pollination occurs to a greater extent.

4688 WIELOCH, E. & SORGE, P.
Die Verwertung der Schwarzen Johannisbeere unter Berücksichtigung der Sorten. (**The utilization of black currants with regard to the varieties**).
Dtsch. Gartenbau 1958 : **5** : 43–46.

Three varieties, Rosenthals Schwarze [Rosenthal's Black] Silvergieters Schwarze [Silvergieter's Black] and Goliath, are compared in respect of their growth, flowering and form and quality of fruit, mention being made of the suitability of the fruit for preserving and the manufacture of jam, syrup, soft drinks and wine.

4689 SAHLSTRÖM, H.
Ett besök hos en Skotsk jordgubbsförädlare. (**A visit to a Scottish strawberry breeder**).
Fruktodlaren 1958 : **29** : 88–90.

Some of the work of R. D. Reid at Auchincruive, Scotland, is outlined, special mention being made of the variety Talisman [XXVI, 687] and of breeding and testing for resistance to red core [XXVII, 146].

4690 LARSSON, G.
Jordgubbar i Norrland. Resultat från försök vid Öjebyn 1954–57. (**Strawberries in Norrland. Results of trials at Öjebyn, 1954–57**).
Försök o. Forskn. 1958 : **15** : 62–63.

Results of the above Swedish trial of eight varieties are outlined. Ydun gave the highest average yield but Abundance Wannberg, which came second, is recommended on account of its regularity of yield and its use both as a dessert and as a preserving variety.

4691 WASSENAAR, L. M.
Determinatietabel en beschrijving van een aantal aardbeirassen. (**Identification key and description of some strawberry varieties**).
Inst. Vered. TuinbGewass. (Undated) : Pp. 51.

In this booklet, published by the Netherlands Institute of Horticultural Plant Breeding, 31 varieties recommended for cultivation in the Netherlands are described. For each variety, synonyms and the distinguishing characteristics are noted and descriptive details provided of plant habit, leaf, flower and fruit characters and runner formation. The descriptions are preceded by a key and by drawings illustrating the descriptive terms used. A diagram showing the relative maturity periods of the varieties is included.

Two new varieties, Glasa and Oranda, are described. The former, from Howard 17 x Deutsch Evern, is very early with fairly large, glossy, conical fruits, moderately good in flavour. Oranda, from Deutsch Evern x Temple, is also early. It shows vigorous plant growth with erect, coarsely toothed leaves and its fruits are fairly large and conical, with rounded tips, and have a good aroma and fresh flavour.

4692 HAWTHORNE, P. L., MILLER, J. C., WILSON, W. F. (JUN.), HORN, N. L. & SISTRUNK, W. A.
Headliner, a new strawberry variety.
Circ. La. agric. Exp. Sta. 1957 : No. 50 : unpaginated.

The pedigree of this new variety, produced at the Louisiana Agricultural Experiment Station, is L–7–27 (Sewanee x L–6–30–45–7) x L–7–42 (Sewanee x Konvoy). It is a high-yielding variety producing its bright red fruits over a long period. Their transporting quality is good and they may be used for dessert or processing. The plants are large and vigorous but are less resistant to *Mycosphaerella fragariae* than Klonmore or Marion Bell.

4693 JONKERS, H.
Accelerated flowering of strawberry seedlings.
Euphytica, Wageningen 1958 : **7** : 41–46.

By hastening germination as the result of scarifying the seed with H_2SO_4 and by short-day treatment of seedlings for 6 weeks at the rate of 8 hr. daily, the time from sowing to fruit ripening was reduced to 8–9 months. Freshly-harvested seed from plants thus forced into flowering was normal in germination capacity. Seedlings of Deutsch Evern should have at least five trifoliate leaves before being subjected to the photoperiodic treatment, and seedlings of Climax and Jucunda at least seven. It is suggested that the method is likely to prove particularly useful in repeated back crossing.

4694 DARROW, G. M.
Exploration in South America for strawberries and other small fruits.
Fruit Var. hort. Dig. 1957 : **12** : 5–7.

In a popular account of his recent visit to South America, the author deals mainly with the collections of cultivated and wild *Fragaria chiloensis* made for use in breeding in the USA.

4695 NEWTON, W. & VAN ADRICHEM, M. C. J.
Resistance to *Verticillium* wilt in F_1 generations of self-fertilized species of *Fragaria*.
Canad. J. Bot. 1958 : **36** : 297–99.

Seedlings of the F_1 generation of selfed plants of *Fragaria* species were inoculated with *V. albo-atrum*. It was concluded that genes for tolerance and resistance are present in *F. chiloensis*, *F. ovalis*, *F. yukonensis* and *F. orientalis*; *F. chiloensis* had the greatest percentage of resistant seedlings. No resistant or tolerant seedlings were found in *F. vesca*, *F. bracteata* and *F. virginiana*. All asexually propagated plants of the seven species were susceptible.

4696 Cosmo, I., Comuzzi, A. & Sardi, F.
Indagini sulla ricostituzione viticola nella pianura della provincia di Padova. Primo contributo. Zona bassa di pianura: sottozona viticola dell'Adige e del Gorzon. Secondo contributo. Zona bassa di pianura: sottozona cerealicola dell'Adige e del Gorzon. (**Studies on the reconstitution of the vineyards in the plain of the province of Padua. I. Lower plain zone: vine-growing subdistrict of the Adige and Gorzon. II. Lower plain zone: grain-growing subdistrict of the Adige and Gorzon**).
Ann. Sper. agr. 1958 : **12** : No. 2 : 585–649.

These studies follow the lines of those published previously [XXV, 40, XXVI, 697, 1792–4 and 3786, XXVII, 897 and XXVIII, 2230]. It is reported that of the red grape varieties Merlot, Barbera and Sangiovese have proved best adapted to the region and that all the rootstocks tested, except for 101·14, have done well, the best being Berlandieri x Riparia, Teleki and Kober 5BB.

4697 **Progress of viticultural investigations at Roseworthy Agricultural College, 1956–57.**
J. Dep. Agric. S. Aust. 1958 : **61** : 443–45.

The article includes an account of grape breeding at the above college, S. Australia. In 1956, selection of parents for vigour and fruit quality among sports and unidentified varieties in the Barossa valley was initiated. Investigations are also being carried out on the suitability of varieties for crossing, with respect to floral morphology and behaviour, germination and seedling management in connexion with breeding, and varietal identification.

4698 Patel, G. I. & Olmo, H. P.
Causes of difference in success in reciprocal crosses between *Vitis vinifera* Linn. and *Vitis rotundifolia* Michx.
Cytologia, Tokyo 1956 : **21** : 411–16.

In a previous paper the authors reported that the cross between *V. vinifera* ($2n = 38$) and *V. rotundifolia* ($2n = 40$) is only successful when the former species is used as ♀ [cf. XXV, 2382]. Further investigations have indicated that failure of the reciprocal cross is not due to inability of the pollen tubes of *V. vinifera* to penetrate the longer styles of *V. rotundifolia*. Absence of swelling of the ovaries even four days after pollination and abscission of pollinated as well as of nonpollinated pistils at about the same time suggested that fertilization did not occur. The cytoplasm of the embryo sac or of the adjacent maternal tissue may secrete a substance inhibiting the further growth and normal discharge of pollen tubes.

4699 Németh, M.
A szőlő klónszelekciós nemesítéséről. (**On breeding grapes by clone selection**).
Agrártudomány 1958 : **10** : No. 2–3 : 43–49.

An account is given of the method of clonal selection. After a discussion of the aims of selection in different types of grapes, the main requirements in comparing clones and carrying out clonal selection are described and the four stages involved in the selection procedure, taking 12 years in all, are outlined.

4700 Cosmo, I. & Polsinelli, M.
"Lambruschi".
(**The Lambrusco vines**).
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. cxv–clxi.

The six black grape varieties described, from the province of Modena, are all used for wine making. Lambrusco grasparossa gives a sweet or dry wine, Lambrusco salamino a pleasing acid wine and Lambrusco de sorbara a dry wine. Lambruscone is occasionally used for dessert but more usually to produce a mediocre dry wine, Lambrusco oliva gives a table wine of moderate quality and Lambrusco Maestri a dry wine.

4701 Cosmo, I. & Polsinelli, M.
"Albana".
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. clxiii–clxxii.

The vine described here gives yellow grapes from which two types of wine are made, one dry and one sweet or very sweet.

4702 Cosmo, I. & Polsinelli, M.
"Ancellotta" o "Lancellotta". (**Ancellotta or Lancellotta**).
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. clxxiii–clxxxi.

The black grapes produced by the variety described are used for making a slightly acid wine. When grown in the province of Trentino the grapes are smaller and the wine produced more acid.

4703 VIOLANTE, C. & BORDIGNON, S.
"Coda di volpe bianca". (**White foxtail**).
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. clxxxiii–cxciii.

A sweet golden-yellow wine is obtained from the yellowish-green grapes produced by this variety, which is described.

4704 MAZZEI, A. & ZAPPALÀ, A.
"Nerello mascalese".
Ann. Sper. agr. 1958 : **12** : No. 2 : Suppl. cxcv–ccii.

The vine variety described gives light blue grapes from which a high-quality table wine is made.

4705 **Dearing grape released.**
Amer. Nurserym. 1958 : **107** : p. 138.

Developed by the US Department of Agriculture in cooperation with the North Carolina Agricultural Experiment Station from a chance seedling, Dearing is a perfect-flowered muscadine variety. Ripening late in midseason, it bears medium-sized, translucent green and fairly sweet fruits. It is recommended for domestic vineyards and as a pollinator of commercial pistillate muscadine varieties.

4706 RODRIGUES, A.
On the application of ampelometric methods.
Brotéria 1957 : **53** : 34–52.

The problem of variation in mean leaf characters along the cane is considered. Varieties differ in the type of variation along the cane that the leaves exhibit. Notes are also included on the best measurements for characterizing the berries and seeds.

4707 NEGRUL', A. M.
(**The wild vine in the Crimea and its connexion with the local varieties**).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1958 : No. 1 : 39–50. [Russian].

The wild vine found in the Crimea (*Vitis vinifera* ssp. *sylvestris*) has seeds of the same shape and dimensions as those occurring in archeological finds at Herson dating from the 3rd to 2nd century BC, and also as those of many local Crimean varieties. It is thought that these varieties may date from the period mentioned or even earlier.

4708 HILPERT, G.
Untersuchungen an frühen meiotischen Stadien von *Vitis vinifera* L. (**Investigations on early meiotic stages of *V. vinifera* L.**).
Vitis 1958 : **1** : 218–23.

Meiosis was studied in pollen mother cells in Riesling 90 and three other seedlings. It seemed probable that pairing took place in early zygotene after spiralization. During pachytene the chromosomes became so coiled up that it was only possible to distinguish some of the structure of the satellite chromosome. Only a little heterochromatin could be seen, there being two pairs of macrochromomeres on either side of the centromere and a central chromomere pair in the long arm. During diacinesis, ± 32 chromosome bodies were counted; most of the chromosomes were univalents. In prometaphase the univalents came together as pairs again and anaphase I and the second meiotic division were in most cases normal, although in a few cells the chromosomes became clumped together, forming balls.

4709 KOZMA, P.
Action du système de taille (charge) et du nombre des feuilles sur le pouvoir de fonctionnement des fleurs de la vigne. (**Effect of the system of pruning and number of leaves on the functional capacity of the flowers of the vine**).
Acta agron., Budapest 1957 : **7** : 175–200.

In studies of a number of varieties at the Hungarian Institute of Viticultural Research, severe pruning followed by defoliation 2–3 weeks before flowering tended to increase pollen germination and decrease female functional capacity, hermaphrodite flowers showing an increased resemblance to male flowers. It is suggested that this corroborates the view that the hermaphrodite flowers of the vine have evolved from male flowers.

4710 KOZMA, P.
Caractérisation comparative chimique inorganique des différentes variétés sexuelles du cépage Kadarka. (**Comparative characterization of different sexual types of the grape variety Kadarka in terms of inorganic chemistry**).
Acta agron., Budapest 1958 : **7** : 365–78.

A detailed survey of the area in which the Kadarka grape is grown in Hungary showed that in regions with dry, shifting calcareous sands a high proportion of female forms occurred while on fertile, compact loess soils male forms predominated. In 1955–56, analysis of shoots from the different sexual types, viz. forms with male, female, hermaphrodite, intermediate and abnormal flowers, revealed little difference in dry matter content but marked variation in ash content, hermaphrodite and female types generally having intermediate contents and forms with abnormal flowers higher contents; the correlation was not close, however. Plants from the compact soils had higher N/P and (N + P)/K ratios than those from shifting sand soils. In 1956 the male type in every region had the highest (N + P)/K ratio and types with female or abnormal flowers the lowest, but in 1955 no regular relation was observed. The proportions of elements in the different soils showed no quantitative relationship with those in the clones growing on them. It is nevertheless suggested that by means of appropriate fertilizer treatments the best sexual types can be maintained.

4711 Alleweldt, G. & Geisler, G.
Untersuchungen über die Zellsaftkonzentration bei Reben. I. Modifikabilität und Variabilität des osmotischen Wertes. (**Investigations on the concentration of cell sap in grapes. I. Modifiability and variability of osmotic values**).
Vitis 1958 : **1** : 181–96.

The osmotic pressure of the cell sap and the refractometric value and pH of the expressed sap were determined for various plant organs of varieties of several *Vitis* species. For the purpose of varietal comparisons, experiments on leaf laminas in the early morning were most convenient. Varietal differences were found in daily fluctuation of osmotic pressure and in variations of osmotic pressure throughout the year, varietal difference being greatest in late summer. The highest average osmotic pressures were found in varieties of *V. vinifera*, with the exception of Riesling 90; much lower average values were found in varieties of *V. rupestris*, *V. monticola* and *V. armata*. As the ground became drier, the osmotic pressure of the varieties rose by differing amounts; in general a negative correlation was found between the osmotic pressure under well-watered conditions and the increase in osmotic pressure under dry conditions. The refractometric value showed in general a positive correlation with the osmotic pressure; the acidity of the cell sap was not related to the concentration.

4712 Cherubini, C. & González, F. F.
Obtención de nuevas variedades de vid sin semilla. (**Production of new seedless varieties of grape**).
Rev. Fac. Cienc. agrar., Mendoza 1955 : **5** : No. 2 : 19–49.

Fifteen seedless hybrids from crosses made in 1947 and 1948 between table varieties and red and white forms of the seedless grape Sultanina are described. Some of the material is receiving colchicine treatment in an attempt to produce varieties with larger fruits.

4713 Kozelkov, Ju. I.
(**For rational utilization of varietal resources of the vine**).
Vinodelie Vinogradarstvo SSSR (Winemak. & Vitic. USSR) 1958 : No. 2 : 33–35. [Russian].

A table is included showing the varieties most suitable for cultivation in the different zones of Azerbaijan and describing their economic uses, the majority being wine varieties. Mention is made of numerous indigenous vines, the technological properties of which need investigating.

4714 Ciobanu, A. & Crişan, L.
Comportarea la păstrarea prin refrigerare a principalelor soiuri de struguri de masă din Romînia. (**Keeping quality under refrigeration of the principal Rumanian varieties of dessert grapes**).
Lucr. Inst. Cerc. aliment. 1958 : **2** : 249–55.

Eleven varieties were compared, the most satisfactory in respect of keeping quality being Hamburg Muscat, Afuz-Ali and Coarnă albă [White Coarnă].

4715 Amerine, M. A. & Thoukis, G.
The glucose-fructose ratio of California grapes.
Vitis 1958 : **1** : 224–29.

The glucose and fructose contents and glucose/fructose ratio are given for eight dessert grape varieties and eleven wine grapes. The ratios varied from 0·8 to 1·12; no relationship between this ratio and ampelographic characters was found. In nine cases the glucose/fructose ratio decreased during ripening and in 10 cases it increased, the increases being negligible for four varieties. Grape varieties with a high fructose content would be useful for cold climates because they produce sweeter tasting musts at lower total sugar contents than the high glucose varieties, which are more suitable for warm climates. The high glucose varieties are suitable for fermentation by the Sauternes strain of yeast and the high fructose grapes for ordinary yeasts.

4716 WAGNER, E.
Über spontane tetraploide Mutanten von *Vitis vinifera* L. (**On spontaneous tetraploid mutants of *V. vinifera* L.**).
Vitis 1958 : **1** : 197–217.

Observations were made at Geilweilerhof on 48 autotetraploid gigas mutants, some of these having arisen from old varieties and others from new hybrids. Pollen grain size appeared to be a constant character; the tetraploid grains were 12 to 28% larger than those of the corresponding diploid forms but their germinating capacity was lower. Berry size was 21–63% greater in the mutants but the diploids produced more seeds per g. of berry; the tetraploids had higher 1000-seed weights and produced more hollow seeds. The weight of must was in most cases higher in the tetraploids and for some forms this increase was considerable. As regards yield and resistance to frost, the mutants showed marked differences.

Some of the tetraploids combined several valuable characters and would be useful in breeding. For example the autotetraploid form of Kalkofen 3–68, a Riesling variety, produces a wine superior to that of the normal form and is also frost hardy.

4717 ALLEWELDT, G.
Eine Frühdiagnose zur Bestimmung der Fruchtbarkeit von Reben. (**Early diagnosis for determining the fruiting capacity of grapes**).
Vitis 1958 : **1** : 230–36.

At Geilweilerhof, varietal differences were found in the size and number of inflorescence primordia occurring in the winter buds of a series of grapes; these values were considered to be useful indications of fruiting capacity. It would however be difficult to forecast the yield of varieties on the basis of such determinations because varieties react differently to the environmental conditions occurring whilst the fruits are developing.

4718 SERGEEVA, R.
(**The vine in the Urals**).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. **3** : 55–57. [Russian].

Malingre Seedling, Černyj Sladkij [Sweet Black], Madeleine Angevine, Sinij Melkij [Small Blue], Vinnyj 3 [Wine 3], Dal'nevostočnyj 60 [Far-eastern 60] and the following forms from Kujbyšev proved hardy in the open under Čeljabinsk conditions: Žigulevskij, Volžskij [Volga], and seedlings 9–2P, 4–10K, 1–12/5 and 1–11/9. All these varieties ripen in mid-September. Seedling 9–2P has a sugar content of 20%; seedling 4–10K is the most productive.

4719 LEBEDEVA, L. JA.
(**A biological description of wild and cultivated forms of *Vitis amurensis* in the Primor'e territory**).
Izv. Timirjazev. sel'skohozjajstv. Akad. (News Timirjazev agric. Acad.) 1958 : No. **1** : 51–72. [Russian].

Wild and cultivated forms of *V. amurensis* at the Far Eastern Research Institute of the USSR Institute of Plant Industry showed great variability with regard to their economic value. A few forms characterized by high yield and fine quality grapes free from foxy flavour have been selected. These forms surpass the Far Eastern standards Al'fa and Taežnyj Izumrud [Taiga Emerald] in hardiness.

4720 FALLOT, J.
Résistance aux basses températures hivernales de quelques hybrides de vignes, greffés. (**The resistance of some grafted hybrid vines to low winter temperatures**).
Ann. Éc. nat. supér. agron., Toulouse 1957 : **5** : 29–44.

At Monlon in the Garonne valley, the reaction of a series of hybrid vines to low temperatures was studied and the effect of various rootstocks on the cold resistance of the scions was noted. The only scion which proved highly resistant to cold was Seyve-Villard 23.512. The rootstock 3.309 Couderc improved the cold resistance of most scions grafted on to it.

4721 HENKE, O.
Untersuchungen über die biochemischen Grundlagen der Reblausresistenz der Reben. (**Investigations on the biochemical foundations of resistance to *Phylloxera* in grapes**).
Phytopath. Z. 1958 : **32** : 149–66.

At Naumburg, a series of grape species and varieties was investigated in respect of the flavone content and composition and the polyphenol-oxidase, peroxidase and catalase activity of their leaves. No consistent relationships were found between any of these properties and resistance to *Phylloxera*, although marked varietal differences were observed. *Vitis cinerea* and crosses involving this species had a particularly low flavone content in the leaves and relatively high polyphenolase and peroxidase activity.

4722 Desneux, R.
Un palmier "pisifera" remarquable. (**A remarkable *pisifera* palm**).
Bull. INÉAC 1958 : **7** : 95–103.

The *pisifera* type designated P21 was found in a local population at Kikongo; it has given an annual oil production of about 38 kg. P21 is fertile and has been selfed and used in making *tenera* x *pisifera* and *dura* x *pisifera* crosses.

FORESTRY

4723 Morandini, R.
Il controllo dell'origine dei semi forestali in Italia. (**The control of forest-tree seed sources in Italy**).
Monti e Boschi 1956 : **7** : 114–22.

The selection and classification of élite stands of coniferous species, begun in 1949 and completed in three years, is described. The methods and criteria adopted are outlined.

4724 Melehov, I. S.
(**Achievements in Soviet forestry science**).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 12 : 120–31. [Russian].

The article refers briefly to selection and vegetative and sexual hybridization of forest trees. Among the practical achievements are a quick-growing giant form of aspen found in the province of Kostroma and a hybrid of *Populus tremula* and *P. bolleana* characterized by hardiness, quick growth, timber of high quality and pyramidal shape of the crown.

4725 Ernst, W., Janson, F., Meyer, A. & Schmitt, R.
Züchtung schnellwachsender Baumrassen in Schweden. (**Breeding fast-growing races of trees in Sweden**).
Verlag Kommentator G.m.b.H., Frankfurt/Main 1954 : Pp. 68.

In this report of a study trip to Sweden, an outline is given of the work of the various forest-tree breeding organizations, chiefly on the selection and propagation of plus trees and the establishment of seed plantations. Most of the work has been described elsewhere and summarized in *Plant Breeding Abstracts*. It is suggested that caution is needed in applying the Swedish methods in Germany, where the much wider range of variation in both genotype and soil types would involve far more extensive testing and selection than are necessary in Sweden.

4726 Bouvarel, P.
L'amélioration des arbres forestiers en Suède et au Danemark. Rapport de mission, Juillet 1953. (**The improvement of forest trees in Sweden and Denmark. Report of the mission, July 1953**).
Ann. Éc. Eaux For. Nancy 1954 : **14** : 153–220.

In surveying the organization of forest tree breeding in Denmark and Sweden, special mention is made of the Danish research stations at Hörsholm and Krogerup and the Swedish establishments at Ekebo, Brunsberg, Kratte Masugn and Stockholm. In Denmark, the breeding is mainly concerned with beech, larch and Douglas fir; in Sweden Scots pine, white spruce and aspen receive most attention. The topics covered in this account include selection of plus trees, grafting techniques used in the multiplication of selected trees, intraspecific hybridization, the maintenance of seed orchards, testing of progeny and provenance types, and tree shows. With respect to interspecific hybridization, mention is made of the breeding of hybrid larch and aspen. Improvement by induced mutation and polyploidy is also considered, reference being made to the production of triploid aspens.

4727 Gustafsson, Å.
Plus- och eliträd. (**Plus and élite trees**).
Skogen 1958 : **45** : 282–83, 286.

It is pointed out that, in accordance with recommendations made at a meeting at the Swedish Forestry Research Institute in 1948, the term plus tree should be used for phenotypically selected individuals showing vigour and good quality, while the term élite should be reserved for trees similar in character to plus trees but whose progeny have also proved good.

4728 Plus- och eliträd. (**Plus and élite trees**).
Skogen 1958 : **45** : p. 314.

A report is presented of the discussion held at the Swedish Forestry Research Institute in December 1948, at which it was proposed that the term plus tree be used for good phenotypes and the term élite tree reserved for phenotypically good trees which have also given good progeny.

4729 En replik. (**A reply**).
Skogen 1958 : **45** : 314–15.

In reply to remarks made by Gustafsson [cf. 4727], it is stated that the term élite continues to be wrongly used by forest-tree breeders.

4730 BASSE, N.
Årsberetning 1957–58. **(Annual report, 1957–58).**
Hedeselsk. Tidsskr., Aarhus 1958 : **79** : 139–72.

Work on forest trees described earlier [3415] is outlined, and the species of pine, spruce and larch involved are listed.

4731 HOUTZAGERS, G.
Bosbouwgenetica en het veredelingswerk in de bosbouw. **(Forest tree genetics and breeding work in forestry).**
Ned. BoschbTijdschr. 1957 : **29** : 54–61.

Forest-tree breeding in the Netherlands since its initiation 10 years ago is briefly surveyed. Work carried out includes selection of plus stands and plus trees, progeny testing, establishment of seed orchards, testing for disease resistance, hybridization and treatment with X-rays and colchicine.

4732 JANSEN, E. C.
De werkzaamheden van de Stichting Verbetering Houtopstanden. **(The activities of the Timber Stand Improvement Foundation).**
Ned. BoschTijdschr. 1957 : **29** : 109–17.

The work of the above organization includes the selection and cataloguing of plus stands and plus trees, vegetative propagation of plus trees, the establishment of trial plantings, the release of tested selections to breeders, the establishment and maintenance of a collection of standards, the preparation of a variety list and the development of seed gardens. Suitable layouts for seed gardens for various types of controlled crosses are discussed.

4733 GATHY, P.
Aperçu des recherches en matière de génétique forestière. **(Survey of research concerning the genetics of forest trees).**
Bull. Soc. roy. For. Belg. 1956 : **63** 393–433.

Forest-tree breeding in Belgium is reviewed and an account is given of the system used in selecting and testing the progeny of élite trees of spruce, *Pinus sylvestris*, the Koekelare race of *P. nigra*, Douglas fir, larch, oak and beech.

4734 CRAM, W. H.
1955 report on shelterbelt tree breeding.
Forestry Nursery Station, Indian Head, Sask. 1956 : Pp. 7.

Caragana. Twelve selections of *C. arborescens* fell into the following compatibility groups: (*a*) six selections which were both self and cross incompatible; (*b*) three with low self compatibility (1–5%) and moderate cross compatibility; and (*c*) three with moderate self and cross compatibility. Selections of groups (*a*) were cross incompatible as pollen parents with group (*b*), while the reverse cross was compatible. Group (*c*) selections were compatible with those of groups (*a*) and (*b*). It is suggested that these results may be explained on the oppositional factor theory on the assumption that dominance decreases as the allelomorphic series progresses, i.e. if selections with the genotypes S_1S_2, S_1S_3, S_2S_3 exhibited increasing degrees of self and cross compatibility. The proposed genotypes are: S_1S_1 for group (*a*), S_1S_2, S_1S_3 etc. for group (*b*); and S_fS_f for group (*c*).

Two polycross blocks have been established at the station.

Spruce. Studies of seed viability in white spruce (*Picea alba*) and Colorado spruce (*P. pungens*) indicated that the optimum time for harvesting is when the moisture content of the cone falls below 50% and the specific gravity below 0·96. Ability to float in linseed oil, which has a specific gravity of 0·94, is regarded as a suitable test for cone maturity. Degree of self compatibility varies among individuals of Colorado spruce, and some cross incompatibility has been found.

4735 CLAUSEN, K.
Skovtræfordædling i de sydlige og sydøstlige stater af U.S.A. **(Forest tree breeding in the southern and south-eastern states of the USA).**
Dansk Skovforen. Tidsskr. 1956 : **41** : 112–28.

Breeding projects seen on a trip through the south-eastern USA include the following.

At Crosset, Arkansas, provenance trials of *Pinus palustris*, *P. elliottii*, *P. taeda* and *P. echinata* are in progress. Combinations between all except the first and the last of these species have been successful. Introduced species are also being tested. Colchicine and X-ray treatments have been used on some species.

In Texas, work on the selection of a drought-resistant *P. taeda* has begun.

Plus-tree selection and crossing are in progress at the university of Florida, the main species being *P. palustris* and *P. elliottii*. At Lake City, Florida, hybrids of *P. elliottii* x *P. palustris* and *P. elliottii* x *P. taeda* have flowered and are being used in further crosses. High resin production has been found to be heritable in *P. palustris*. *P. elliottii* progenies combining

high resin production with rapid growth are undergoing tests.
At the University of Georgia, *P. echinata* individuals appearing resistant to *Phytophthora cinnamomi* are being tested and intercrossed.
Plus tree selection and crossing of pines has been initiated at the Ida Cason Galloway Foundation, Hamilton, Georgia. The work of the Tennessee Valley Authority includes provenance trials and the development of hybrid poplars.

4736 HAIR, J. B. & BEUZENBERG, E. J.
Chromosomal evolution in the Podocarpaceae.
Nature, Lond. 1958 : **181** : 1584–86.

Observations on species representing all the genera of the family are interpreted as suggesting that a progressive reduction in basic number is a major factor in the chromosomal evolution of the family. This reduction is considered to be the result of "fusion" (unequal interchange) of nonhomologous I chromosomes and subsequent elimination of the associated and presumably genetically inert centric fragment, the number of fusions corresponding to the number of pairs of V chromosomes.

4737 BROEKHUIZEN - VAN STRAATEN, L. E.
Vegetatieve vermeerdering ten behoeve van het veredelingswerk in de bosbouw. (**Vegetative propagation as an aid in forestry breeding work**).
Ned. BoschbTijdschr. 1957 : **29** : 62–65.

Vegetative propagation by means of cuttings and grafting is described. Larch and Douglas fir may be grafted in the open and birch in the greenhouse; Scots pine has also been successfully grafted in the open. Experiments with rooting of cuttings are under way; so far, cuttings of Douglas fir and young larch have been found to root readily.

4738 BROWNING, B. L.
Chemical characterization of wood samples for the forest geneticist.
TAPPI, Pa. 1958 : **41** : No. **4** : 156–58.

Difficulties which may be encountered in choosing the appropriate chemical constituents for analysis when aiming at a specific improvement in the raw or end product, problems involved in sampling procedure and the limitations of analytical methods are discussed in a general way, in order to show the basic considerations which the chemist and analyst on the one hand and the geneticist on the other should bear in mind when wood sampling is undertaken as part of a breeding programme.

4739 VAN VLOTEN, H.
Resistentie-onderzoek als onderdeel van de veredeling van bosbomen. (**Resistance research as a branch of forest tree breeding**).
Ned. BoschbTijdschr. 1957 : **29** : 91–95.

The need for extensive testing for disease and pest resistance throughout the breeding programme is emphasized, the aim being the avoidance of the sudden appearance of unexpected parasites.

4740 TUCKER, J. M. & MULLER, C. H.
A reevaluation of the derivation of *Quercus margaretta* from *Quercus gambelii*.
Evolution, NY 1958 : **12** : 1–17.

Evidence on the morphology of the above two species and on the biotic associates and edaphic preferences of *Q. gambelii* has led to a revision of the hypothesis previously suggested by the second author concerning the origin of *Q. margaretta* [XXIII, 1489]. It is now concluded that *Q. gambelii* did not undergo any extensive eastward migration as recently as the Pleistocene or late Pliocene period, and that similarities between this species and *Q. margaretta* are probably best interpreted as characters indicative of origin of the two species from a common ancestral stock not more recently than during the middle Tertiary age.

4741 KOHNO, N. A.
(**A change in the shape of leaf blade. Oak**).
Priroda (Nature), Leningrad 1958 : No. 2 : 99–100. [Russian].

An oak with a shoot bearing simple leaves is described from Kiev. The shoot arose from the callus formed where a walnut scion had been grafted on the oak.

4742 MULLER, C. H.
Significant recent collections of *Quercus* from Panama.
Trop. Woods 1958 : No. 108 : 74–76.

A description is included of a newly recognized entire-leaved black oak, *Q. baruensis*.

4743 HELLINGA, G.
Selectie en veredeling van Leuce-populieren op het Bosbouwproefstation T.N.O. (**Selection and breeding of *Leuce* poplars at the Forestry Experimental Station of the Central Organization for Research in Applied Science**).
Ned. BoschTijdschr. 1957 : **29** : 70–81.

Crosses effected at the above station include intraspecific crosses of Netherlands *Populus* *tremula*, Polish *P. tremula*, *P. tremuloides* and *P. grandidentata* from the USA, Netherlands *P. alba* and *P. alba* var. *bolleana* and *P. canescens*. Interspecific crosses include Netherlands *P. tremula* x *P. tremuloides*, Polish *P. tremula* x *P. tremuloides* and Netherlands *P. alba* x Polish *P. tremula*. The technique of crossing is described. A number of the above combinations, particularly those involving the Polish *P. tremula* either as male or female parent, are very promising.

4744 van Buijtenen, J. P., Joranson, P. N. & Einspahr, D. W.
Diploid versus triploid aspen as pulpwood sources with reference to growth, chemical, physical, and pulping differences.
TAPPI, Pa. 1958 : **41** : No. **4** : 170–75.

Compared with adjacent diploids, wild triploids of *Populus tremuloides* found in Michigan had more rapid growth and higher measurements for specific gravity, fibre length, and to a lesser degree, fibre width, vessel diameter and α-cellulose content. The triploids gave pulps with greater tearing strength and lower values for permanganate number and apparent density. No significant differences were found between diploids and triploids in fibre-wall thickness or cross-sectional area of the vessels. Diploids were however also promising in wood and pulp properties and, like the triploids, showed wide tree-to-tree variation in these respects. The results indicated that breeding to improve the species as a source of pulpwood merits attention, fundamental studies, especially to distinguish between genetic and environmental effects, being required in this connexion. Increased fibre length was a major factor promoting high tearing strength, while fibre strength, as measured by the zero span test, played an important role in influencing both tensile strength and bursting strength of the pulp. Attention is therefore drawn to increases in fibre length and strength as possible objectives in aspen-breeding programmes having stronger paper as their final aim.

4745 Broekhuizen, J. T. M.
Selectie van populieren van de groep Aigeiros. (**Selection of poplars of the section Aigeiros**).
Ned. BoschbTijdschr. 1957 : **29** : 66–69.

Work conducted in the Netherlands is described. Promising material from other countries is tested in the form of cuttings for growth and disease resistance. Clones resistant to *Pseudomonas syringae* are then tested over longer periods for form, quality and other characters.

4746 van den Ende, G.
Het onderzoek naar de populierenkanker veroorzaakt door *Pseudomonas syringae* V. Hall f.sp. *populea* Sabet. (**Research on poplar canker caused by *Ps. syringae* V. Hall f.sp. *populea* Sabet**).
Ned. BoschbTijdschr. 1957 : **29** : 101–09.

Investigations conducted at the Willie Commelin Scholten Laboratory in the Netherlands are reported. Of numerous poplar species tested, *Populus nigra* var. *italica*, *P. nigra* var. *plantierensis*, *P. tristis*, *P. rasumowskyana*, *P. gelrica*, *P. serotina* var. *erecta* and *P. berolinensis* were resistant. The reaction of some species varied from year to year. Although *P. marilandica* was in some years moderately susceptible, it gave a high proportion of resistant progeny in crosses with other species. *P. nigra* and *P. nigra* var. *italica* were also good parents, while *P. trichocarpa* invariably gave many susceptible offspring. Seedling resistance generally appeared to decrease with age, but there were exceptions to this. Since testing for resistance cannot be completed in one year, it is recommended that testing for other qualities be carried out first and the most promising be retained and tested in the form of cuttings for resistance.

4747 Schröck, O.
Die Graupappel und ihre vegetative Vermehrung. (***Populus canescens* and its vegetative propagation**).
Züchter 1958 : **28** : 71–80.

From studies in northern Germany, the author concludes that *P. canescens* exists as a true species distinct from hybrids between *P. alba* and *P. tremula*. It was found that female clones had crooked trunks and male clones had straight trunks and narrower crowns; it is thought that the form of the trunk may be determined by hereditary factors linked with sex. Individual trees showing resistance to rusts or *Saperda populnea* were discovered but it has not yet been decided whether resistance to these pathogens is hereditary.

4748 Taris, B.
Contribution à l'étude des maladies cryptogamiques des rameaux et des jeunes plants de peuplier. (**A contribution to the study of the cryptogamic diseases of branches and young plants of poplar**).
CR Acad. Agric. Fr. 1958 : **44** : 159–61.

Of the four varieties studied, the Italian

Populus euramericana 'I214' has shown most resistance to *Dothichiza populea*, *Cytospora chrysosperma* and *Fusarium avenaceum*.

4749 Čihladze, L. S.
(A change in the shape of leaf blade. Oriental beech).
Priroda (Nature), Leningrad 1958 : No. 2 : 99–100. [Russian].

A new form of *Fagus orientalis*, with obcordate leaves lobed at the apex but less so at the base of the branch, is reported from Georgia.

4750 Heybroek, H. M.
Iepenveredeling in Nederland. **(Elm breeding in the Netherlands).**
Ned. BoschbTijdschr. 1957 : **29** : 96–100.

An extended version of this paper has been summarized already [XXVII, 4509].

4751 Holmes, F. W.
Distribution of sexual-compatibility strains of *Ceratocystis ulmi* in Massachusetts.
Phytopathology 1958 : **48** : p. 263. (Abst.).

Cultures of *Ceratocystis* (*Ceratostomella*) *ulmi* from 11 counties in Massachusetts were studied and indications were found that the distribution of the compatibility strain B is limited to eastern Massachusetts; genetic recombination cannot therefore occur in the western part of the state. It is thought that if elms resistant to the Dutch elm disease are introduced into this area, new pathogenic strains of *C. ulmi* capable of overcoming resistance should not arise quickly.

4752 Went, J. C.
Verslag van de onderzoekingen over de iepenziekte en andere boomziekten, uitgevoerd op het phytopathologisch laboratorium "Willie Commelin Scholten" te Baarn gedurende 1952 en 1953. **(Report on investigations on Dutch elm disease and other diseases at the "Willie Commelin Scholten" Phytopathological Laboratory, Baarn, 1952–53).**
Meded. Com. Ziekt. Boomsoorten 1955 : No. 48 : Pp. 12.

In elm crosses and selfings the highest percentage of plants resistant to Dutch elm disease was obtained using *Ulmus carpinifolia* 62, named Bea Schwarz. Susceptible forms of *U. hollandica* gave entirely susceptible progeny. Bea Schwarz was particularly good as ♀ parent and *U. carpinifolia* 1 as ♂. Self pollination generally yielded very few fertile seeds. In 1952 sufficient hybrids were obtained to allow parental influences on leaf shape and growth to be detected. Seedlings from the fast-growing form *U. glabra* 49 as ♂ parent were short with distinctive leaf and shoot characters. *U. pumila* hybrids used as ♀ parent usually gave offspring carrying *pumila* characters. Dwarf seedlings generally included *U. hollandica* var. *vegeta* or *U. glabra* in their parentage. Wide leaves and rapid growth occurred in crosses between *U. laciniata* var. *nikkoensis* x *U. wallichiana* and *U. glabra* var. *fastigiata* x *U. wallichiana*.

4753 Barlow, B. A.
Diploid and tetraploid *Casuarina littoralis* Salisb. (Syn. *C. suberosa* Ott. & Dietr.).
Aust. J. Bot. 1958 : **6** : 38–46.

Tetraploid and diploid forms of *C. littoralis* were found with 44 and 22 chromosomes respectively. The tetraploid had a much wider distribution throughout eastern Australia and Tasmania; it is more vigorous than the diploid and is thought to be probably an allotetraploid. Hybridization seems to have occurred where the two forms come into contact, the hybrids having reduced fertility.

4754 Kutuzkina, E. F.
(A plane from the Sarmatian deposits in the North Caucasus).
Bot. Ž. (Bot. J.), Moskva 1958 : **43** : 81–85. [Russian].

Specimens of *Platanus lineariloba* found in tertiary deposits are described and illustrated. They show a certain resemblance to species such as *P. digitata* and *P. cuneata*, known to be hybrids between the western planes and *P. orientalis*, and are thought to be representatives of a prototype of *P. orientalis* which had a wider area than that species has today.

4755 Leibundgut, H.
Beitrag zur Rassenfrage bei der Esche. **(Contribution to the problem of races in the ash).**
Schweiz. Z. Forstw. 1956 : **107** : 165–74.

Seedlings from ashes of good type growing on damp mineral soils and others of poor type from dry chalky soils were grown on a series of different soils. The results indicated that time of flushing, height, dry weight of the roots, root length and ash content of the wood differed according to the soil on which the seedlings were grown rather than according to the parental tree characters.

4756 Li, C.-L.
(A monecious tree of *Ginkgo biloba*).
Chi-wu-hsueh Pao/Act. bot. sin. 1957 : **6** : 189–93. [Chinese].

A tree growing near Peking has male branches in the lower part and male and female branches above. While the possibility that this condition has resulted from grafting has not been excluded, the author inclines to the supposition that the tree is genuinely monecious.

4757 Syrach Larsen, C.
Improving strains of windblown Scots pine.
Sylva, Edinb. 1955–56 : **36** : 5–7.

Thirty-four clones obtained from outstanding trees in Scotland blown down in the severe gales of 1953 are described briefly. Grafted on to seedling stocks at Hørsholm in Denmark, they have so far appeared vigorous and healthy and some have flowered.

4758 Wang, C.-W. & Perry, T. O.
The application of genetics in southern forestry.
Consultant 1957 : **2** : No. **3** : unpaginated.

The selection and propagation of superior trees of *Pinus elliottii* and *P. taeda* and methods used in the production of seed at the University of Florida are discussed.

4759 Wakeley, P. C.
Progress in study of pine races.
Sth. Lumberm. 1953 : **187** : 137–40.

The following racial differences among seedlings are noted. In loblolly pine (*Pinus taeda*), trees from Maryland seed are distinguished by their well developed fibrous roots and their resistance to cold. Southern stocks of *P. elliottii* var. *elliottii* grown in north western Florida showed more winter injury than more northerly stocks. Shortleaf pines (*P. echinata*) from New Jersey or Pennsylvania or from high altitudes grew more slowly further south than seed from lower altitudes and latitudes. Differences in leaf colour in cold weather were also observed among material from different sources. Seedlings of longleaf pine (*P. palustris*) from the Georgia Coastal Plain developed more strongly branched root systems than those from Louisiana.

4760 Echols, R. M.
Variation in tracheid length and wood density in geographic races of Scotch pine.
Bull. Yale Univ. Sch. For. 1958 : No. 64 : Pp. 52.

The trees studied were grown at Hillsboro, New Hampshire, USA, from seed received in 1938 from fifteen sources in Europe, ranging from the extreme north of Norway to northern Italy. At 17 years of age the trees of northern provenance were much shorter and somewhat straighter than those of southern provenance, the tallest trees being those from Poland, while bark thickness increased from north to south following the pattern for diameter at breast height. A highly significant variation in tracheid length was found, with an extremely high correlation between tracheid length and tree height, and other correlations almost as high were found for latitude of provenance with tracheid length, tree height, bark thickness, diameter and wood density. A very highly significant linear relationship was established for the following pairs of characters: wood density and diameter, width of growth ring and tracheid length, and wood density and tracheid length.

It is pointed out that the differences in day length and temperature between New Hampshire and the localities from which the seeds were obtained may have affected the growth of trees genetically adapted to longer days during the summer.

4761 Hesseltine, C. W. & Snyder, E. B.
Attempts to freeze-dry pine pollen for prolonged storage.
Bull. Torrey bot. Cl. 1958 : **85** : 134–35.

Unsuccessful attempts to freeze-dry pollen of *Pinus palustris* are described; the lyophil process was used.

4762 Schütt, P.
Schwankungen im Zellulose- und Ligningehalt bei einigen in Westdeutschland angebauten *Pinus contorta*-Herkünften.
(Variation in cellulose and lignin content in some provenance races of *P. contorta* grown in Western Germany).
Silv. genet. 1958 : **7** : 65–69.

Analyses of the timber of races of *P. contorta* of varying provenance growing in Bavaria indicated that the highest contents of cellulose are found in types originating from the coastal region of Washington and the inland district of Kamloops, British Columbia. The trees from Washington and others from Oregon had much less lignin than those from Kamloops. No relationships were found between diameter at breast height and cellulose content or between various other morphological characters and cellulose and lignin content.

4763 Perry, T. O. & Wu, W. C.
Variation in the specific gravity of slash pinewood and its genetic and silvicultural implications.
TAPPI, Pa. 1958 : **41** : No. 4 : 178–80.

The range of variation in specific gravity among stands of *Pinus elliottii* in the same region of the USA or among individual trees was greater than the range in variation among different regions. No correlation was found between specific gravity and growth rate. An alignment chart for determining the relationship between the wood volume, specific gravity and dry-pulp yield of a tree is presented. By means of this chart, trees may be selected for potential dry-pulp yield when the wood volume and specific gravity are known. The chart reveals the possible pitfall of selecting phenotypes with high specific gravity at the expense of superiority in wood volume. Data obtained by the authors and other investigators indicate that 22% is the theoretical maximum increase in pulp yield which may be expected as the result of selection and breeding for high specific gravity. It is however considered unlikely that the first cycle of improvement will lead to even half of this theoretical maximum.

4764 Zobel, B. J., & McElwee, R. L.
Natural variation in wood specific gravity of loblolly pine, and an analysis of contributing factors.
TAPPI, Pa. 1958 : **41** : No. 4 : 158–61.

Tree-to-tree variation in the specific gravity of the mature wood of loblolly pine (*Pinus taeda*) has always been found to be much greater than the variation associated with different sites or geographical regions in the USA. A broad geographical trend has been detected in the south-eastern states in the magnitude of the average specific gravities of the mature wood, which tend to decrease in a westward direction. For wood of the same age, little relationship exists between growth rate and specific gravity. Selection of fast-growing trees does not therefore necessarily result in selection of wood with lower specific gravity. The breeding of strains lower or higher in specific gravity than the average is regarded as feasible [cf. 4765].

4765 Zobel, B. J. & McElwee, R. L.
Variation of cellulose in loblolly pine.
TAPPI, Pa. 1958 : **41** : No. 4 : 167–70.

Preliminary results from a study of variation in cellulose yield of loblolly pine (*Pinus taeda*) according to tree, site and geographical region in the USA are given. A rapid method of analysing small samples of wood was devised, the percentage yields of water-resistant carbohydrates (WRC) and α-cellulose being determined. Percentage of WRC was always highly correlated with α-cellulose content. In addition, WRC percentage in juvenile wood was as a rule highly correlated with that of mature wood; a similar relationship between juvenile and mature wood was also found with respect to α-cellulose. Tree-to-tree variation in both WRC and α-cellulose content in juvenile or mature wood was considerable. On a volume basis, but not on a weight basis, cellulose yield was closely associated with specific gravity.

4766 Zobel, B. & Cech, F.
Pines from Nuevo León, Mexico.
Madroño, S. Francisco 1957 : **14** : 133–44.

A collection of pines from the above region is described. Many of the samples failed to tally with previously described species. Intergradation between taxa hitherto distinguished was particularly evident in the 5-needled pines.

4767 Kaloyereas, S. A.
A new method of determining drought resistance.
Plant Physiol. 1958 : **33** : 232–33.

A laboratory test based on the heat stability of chlorophyll has been devised for evaluating drought resistance, using strains of *Pinus taeda* representing a known range in drought resistance. Samples of the needles were placed in tubes containing distilled water and heated in a water bath at 56° ± 1° C. for 30 min. The difference between the light-absorption readings of the chlorophyll extracts of heated and unheated samples of a strain was defined as the chlorophyll stability index. Among the six strains tested, the indices were closely correlated with drought resistance. This method appeared to give more reliable results than determination of bound water or estimation of extractable sulphydryl groups.

4768 Treschow, C.
Forsøg med rødgranracers resistens overfor angreb af *Fomes annosus* (Fr.) Cke.
[**Experiments on the resistance of races of Norway spruce to attack by *F. annosus* (Fr.) Cke**].
Forstl. Forsøgsv. Danm. 1958 : **25** : 1–23.

In studies in which the heartwood of trees of German, Norwegian, Russian, Finnish and Danish provenance was inoculated with *F. annosus*, no evidence of differences in resistance was obtained. The experiments were carried out in 1937–40 in various localities in Denmark.

4769 Petersen, B. B. & Søegaard, B.
Studies on resistance to attacks of *Chermes cooleyi* (Gill.) on *Pseudotsuga taxifolia* (Poir.) Britt.
Forstl. Forsøgsv. Danm. 1958 : **25** : 35–45.

Among 32 clones grown under uniform conditions, marked interclonal differences in severity of attack by *Ch. cooleyi* were observed over the period 1954–56, one clone remaining completely free from attack. Intraclonal variation in susceptibility was low, suggesting that resistance is genetically determined.

VEGETABLES

Eighth Annual Report of the National Vegetable Research Station, Wellesbourne, Warwick 1957 (1958) : Pp. 67.

4770 *Haigh, J. C. Plant breeding report.* (*pp. 11–14*).

Red beet. Progress has been made in the selection of a nonbolting strain of Detroit.

Onion. Work on the development of hybrid onions, using cytoplasmic male-sterile lines, continued.

Brussels sprouts. Crosses between inbreds were studied with respect to combining ability and hybrid vigour. One trial was of hybrids between selected S_1 plants of Cambridge 3 and S_2 selections of Cambridge Special. Vigour was equal to that of noninbred material, most of the hybrids resembling Cambridge Special in quality and dark green colour. The best family outyielded the more productive parent, Cambridge 3, by 66%. Male sterility has been discovered in each of the three varieties which have been subjected to inbreeding; production of hybrid seed will thus be facilitated.

Lettuce. Absence of symptoms of mosaic was shown, by back inoculation to a susceptible variety, to be due to tolerance [cf. XXVII, 4524]. Symptoms of mosaic appeared on F_4 plants from selfed symptomless F_3 progenies. Symptomless F_4 plants were selfed to produce progenies for further study. Exploration of the possibility of inducing mosaic-resistant mutants of Borough Wonder by seed irradiation continued.

Pea. An attempt is being made to produce a winter-hardy culinary pea of good quality. F_2 hybrids and back crosses obtained from combinations between hardy maple peas and culinary varieties are to be subjected to natural selection for winter hardiness.

4771 *Watts, L. E. & George, R. A. T. Classification and performance of varieties of radish.* (*pp. 15–27*).

The 114 varieties studied were divided into seven main classes which, on the basis of the shape and size of root and leaf, were subdivided into 31 groups. Lists of varieties and details of performance are provided.

4772 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1956. V. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety trials, 1956. V. (In connexion with the Commission for the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuburg : Ser. B. : 1958 : **8** : 100–15.

Results of tests with varieties of beetroot, cabbage, beans and root parsley are reported.

4773 Philipp, F.
Ergebnisse der Gemüsesortenversuche 1957, I. (Im Rahmen der österreichischen Zuchtbuchkommission). [**Results of vegetable variety trials 1957, I. (In connexion with the Commission of the Austrian Book of Cultivated Varieties)**].
Mitt. Klosterneuburg : Ser. B. : 1958 : **8** : 161–79.

Results of tests with varieties of lettuce and radish are reported.

4774 Lambert, A.
A fajtakiválasztás jelentősége a zöldséghajtatásban. (**The importance of choice of varieties in vegetable forcing**).
Kertész. szőlész. Főiskol. Évköny. 1956 : **20** : 1–26.

The results of trials of tomato, *Capsicum*, cucumber and lettuce in the greenhouse and the hotbed, conducted in 1954–55 at the Institute of Vegetable Crops of the Hungarian College of Horticulture and Viticulture, are reported and recommendations made regarding varieties suitable for different periods of production. Hybrid peppers outyielded both parents and the following results of crossing were obtained in the F_1: green fruits x white fruits gives intermediate types; pendent x erect fruits, pendent; pungent x nonpungent, pungent; early x late, early, in most cases; long x short fruits, intermediate; single x clustered fruits, single; and long x short stem, intermediate. Hybrids showed greater disease resistance than their parents. Magyar hegyes [Hungarian Pointed], Tőrhüvely [Dagger Sheath], Cecei édes [Cece Sweet] and Kalinkói zöld [Kalinkói Green], were particularly good parent varieties.

4775 BREŽNEV, D. D.
(Agricultural science in its struggle for high vegetable yield).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 11 : 90–98. [Russian].

The results of breeding new early and productive varieties of cucumber, tomato and other vegetables for culture under glass are briefly reviewed.

4776 Årsoversikt over forsöksvirksomheten i hagebruk i 1957. **(Survey of research in horticulture in the year 1957).**
Oslo (undated) : Pp. 82. (Mimeographed).

In addition to providing notes on trials and breeding aims at various stations in Norway, this report includes the following information.

Cabbage. None of the commercial varieties investigated had satisfactory clubroot resistance, but very good resistance has been found in a number of breeding lines. The latter are not yet sufficiently good in quality, form or keeping capacity. The F_1 of crosses between susceptible and resistant cabbages are susceptible and it appears that several genes are involved. Varieties resistant in the USA lose their resistance at Ås, where there seem to be several races of the pathogen. Morphological mutants of resistant material have been induced by means of cobalt-pile radiation.

Tomato. Several F_1 hybrids are being tested. Hybrids in which one of the parents is a bush variety have been particularly promising as regards earliness. Of **14** new open-air bush tomatoes tested, most were far more resistant to splitting than Bonita. Particularly early short-stemmed lines have been found among bush varieties.

Phaseolus. Lines from Saxa x Olsok are undergoing test, the aim being the production of a variety combining stringlessness and good quality with the earliness of Olsok. Lines from Gyldenhöst [Golden Harvest] x bredskolma Balin [Broad-podded Balin] may prove useful as sources of resistance to *Ascochyta.*

Pea. Studies of the inheritance of photoperiodic behaviour have led to the production of new day-neutral combinations in both sugar peas and canning peas.

Parsley. Varietal differences in overwintering ability have been observed.

4777 SNEEP, J.
De rassenproeven met groentegewassen. **(Varietal tests of vegetable crops).**
Zaadbelangen 1958 : **12** : 131–32.

An outline is given of the various kinds of varietal testing undertaken by the Netherlands Institute of Horticultural Plant Breeding, the General Netherlands Inspection Service for Vegetable seed, the experimental stations and the National Horticultural Advisory Service.

4778 HASTINGS, W. R.
All American selections.
Sth. Seedsman 1958 : **21** : No. **3** : 19–21.

Two vegetable varieties have been given awards for 1959, Jade Cross brussels sprout and Gardengreen snapbean.

The new brussels sprout is an F_1 hybrid developed by Takii and Co. Ltd., Kyoto, Japan, and is vigorous and early maturing. It yields well throughout the year but the sprouts are of better quality when produced in cooler weather in spring and autumn. It is resistant to black rot and downy mildew.

Gardengreen is a bush variety developed by the Charter Seed Co., Twin Falls, Idaho, giving good yields of straight, stringless, round pods about five inches long. Their quality is excellent and they are held well off the ground. It is resistant to mosaic and tolerant of halo blight and root rot and is recommended for garden and commercial use.

4779 ALEKSANDROV, S. V.
(Hybrid seed production of cucumbers and tomatoes in hothouses).
Vestn. sel'skohozjajstv. Nauk. (Rep. agric. Sci.) 1957 : No. 9 : 46–56. [Russian].

An account of breeding heterotic hybrids of forcing cucumbers and tomatoes at the Institute of Plant Industry is given. Among the cucumbers showing heterosis for earliness and high yield were hybrids of Klinskij 2137 ♀ with Leningradskij Tepličnyj 23 [Leningrad Hothouse 23], Vostočnyj 571 [Oriental 571], Lučšij iz Vseh 161 [Best of All 161] or Ržavskij as the pollen parents, Klinskij 2137 x Leningradskij Tepličnyj 23 being outstanding. The latter yielded 2·3 kg. more fruit per m². than Klinskij 2137 by 1 June, the total yield increment being 6·1 kg./m². The best heterotic hybrids of tomatoes were Leningradskij Skorospelyj 2166 [Leningrad Early 2166] x (Leningradskij Skorospelyj x Bison), Tepličnyj Brežneva [Breznev's Hothouse] x Bison and Tepličnyj Brežneva x (Bison + *Cyphomandra*). All these outyielded Leningradskij Skorospelyj 2166 and trebled the yield of first fruits.

4780 FUKUSHIMA, E. & TOKUMASU, S.
On the occurrence of aneuploidy in the offspring of the artificially induced auto-tetraploid plants in Japanese radish (*Raphanus sativus* L.) and Chinese cabbage (*Brassica pekinensis* Rupr.).
J. Fac. Agric. Kyushu Univ. 1957 : **11** : 1–23.

The progeny of one colchicine-induced tetraploid plant of each of the above species were the object of this study. In both cases tetraploid seed was larger than diploid, while triploid seed was small, averaging about one third of the size of diploid seed. Diploid and triploid seed germinated well while tetraploid seed showed poorer germination and differences between seedlings of different chromosome number were observed in respect of cotyledon size, growth rate, time of flowering, size of guard cells and number of chloroplasts in the guard cells. Meiosis in the triploid and tetraploid plants was nearly regular but some of the progeny of the tetraploids were found to be hypotetraploid or hypertetraploid and these plants showed some meiotic irregularities. Pollen viability was high in both triploids and tetraploids and it is suggested that the occurrence of aneuploid plants may be due at least partially to pollination by aneuploid gametes. The difficulty of maintaining pure tetraploid stocks is discussed.

4781 MESSERI, P.
Sviluppo vegetativo e maturità riprottiva in piante ottenute da semi irradiati con raggi X. **(Vegetative development and reproductive maturity in plants obtained from X-irradiated seeds).**
Nuovo. G. bot. ital. 1957 : **64** : 261–65.

Data are provided on the germinability and subsequent rate of development of plants obtained from X-irradiated lettuce, spinach, pea and broad-bean seeds.

4782 EL MURABAA, A. I. M.
Factors affecting seed set in Brussels sprouts, radish and cyclamen.
Meded. LandbHoogesch., Wageningen 1957 : **57** : No. 4 : 1–33.

In both Brussels sprouts and radish, successful pollination, estimated by seed set, showed two peaks after selfing, the first reached a few days before and the second, which in Brussels sprouts was lower than the first, a few days after anthesis, while for cross pollination only one peak was observed and this occurred at the time of anthesis and was appreciably higher than for self pollination. In both cases the period of successful pollination was shorter at higher temperatures. Germination of self pollen on the stigmas of self-incompatible plants was very poor and the pollen tubes did not penetrate the stigmatic tissue. Treatment of the stigmas of Brussels sprouts with α-naphthylacetamide or those of radish with the same growth substance or with p-chlorophenoxyacetic acid resulted in a decrease in seed set, whether the flowers were selfed or crossed.

4783 SVENSSON, V.
Weibulls London torg II. En ny frilandsmorot. **(Weibull's London torg II, a new outdoor carrot).**
Weibulls Allehanda 1958 : No. 1 : 14–16.

The new carrot London torg II [London Market II], previously known as line 1021 [cf. 2639], is distinguished from the older strain London torg W : s/54 by its better colour, higher β-carotene content, longer roots and greater resistance to splitting.

4784 BENZONI, F. & MOJA, A.
Mezzi di identificazione precoce dei caratteri genofenotipici in *Daucus carota* L. **(Methods of early identification of the genophenotypic characters in *D. carota* L.).**
Ann. Fac. Agr. Milano 1954 : **3** : 177–97.

Experiments are described in which the roots were cut transversely and longitudinally respectively, in each case removing half the root and transplanting the remainder. In a third variant a sector amounting to roughly one quarter of the root was removed from the lower half before transplanting. The best survival was noted in the controls, uncut, and in those cut transversely. No marked differences in flowering were detected, except that those cut longitudinally bore a smaller number of inflorescences. The mean seed yield per plant amounted to 16·4 g. in the controls, 13·3 g. in those cut longitudinally, 11·6 g. in those cut transversely and 10·5 g. in those with a quarter removed.
In similar experiments carried out the following year, the inferiority of the roots cut longitudinally was more pronounced and only 7% of them came into flower. Those cut transversely yielded 12·6 g. of seed per plant whereas those with a quarter removed yielded 21·1 g., compared with 21·7 g. from the controls. No marked differences were observed in 1000-seed weight and germination capacity of the seeds. It is concluded that roots from which the lower portion has been removed for histological

observations can safely be used for seed production in breeding operations.

4785 Boczkowska, M.
Quelques observations sur les dégâts causés par *Psila rosae* F. sur diverses variétés de carottes cultivées à la ferme expérimentale de Sainte-Anne-de-la-Pocatière au cours de l'année 1956. **(Some observations on the damage caused by *Ps. rosae* on different varieties of carrot cultivated at the experimental farm of Sainte-Anne-de-la-Pocatière during the year 1956).**
Ann. ent. Soc. Quebec 1956 : **2** : p. 75. (Abst.).

Of the 14 varieties tested, the two most resistant to *Ps. rosae* had 6·85% and 9·35% damaged; for the others the percentage ranged between 28 and 74%.

4786 Nishi, Y. & Nishizawa, T.
(Studies on the varietal resistance of horticultural plants to virus diseases. IV. The relation between virus-disease symptoms and yield in the radish).
Kyushu Nogyo Shikenjo Iho/Bull. Kyushu agric. Exp. Sta. 1956 : **4** : 225–32. [Japanese].

Data are provided on the virus symptoms observed in a series of Japanese varieties and on their yields when virus-free and infected. The most resistant varieties were Taibyoseihayabutorinerima [Disease-resistant Early Large Nerima], Banseisakurajima [Late Sakurajima] and Takakura.

4787 Küppers-Sonnenberg, G. A.
Vergleichbarkeit von Topinamburerträgen in der Leistungsprüfung. **(Comparability of Jerusalem artichoke yields in performance trials).**
Saatgutwirtschaft 1958 : **10** : 135–36.

Mention is made of environmental factors and cultural treatments which may influence the yields obtained in varietal testing of Jerusalem artichokes.

4788 Sugawara, T.
(A new strain of Jerusalem artichoke and its method of cultivation).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 537–40. [Japanese].

A description is given of an improved Japanese strain which produces a higher yield of root tubers than the strain commonly grown.

4789 Gaudineau, M. & Lafon, R.
Sur la maladie à sclérotes du topinambour. **(On the disease of the Jerusalem artichoke caused by *Sclerotinia*).**
CR Acad. Agric. Fr. 1958 : **44** : 177–78.

After testing a series of varieties of Jerusalem artichoke at two centres in south-west France, it was concluded that V71, D1, D2 and Patate Vilmorin [Vilmorin Potato] are resistant to *S. minor* and *S. sclerotiorum*.

4790 Pazourková, Z.
K otázce amitosy u *Allium cepa*. **(The question of amitosis in *A. cepa*).**
Preslia 1956 : **28** : 397–99.

The writer observed mitosis only in the root meristems of onion, no amitosis of the kind reported by some Soviet investigators having been seen.

4791 Jackson, W. D. & Barber, H. N.
Patterns of chromosome breakage after irradiation and ageing.
Heredity 1958 : **12** : 1–25.

Similar patterns of chromosome breakage were noted in root tips of seedlings of *Allium cepa* from X irradiation and aged seed, 98% of the aberrations being simple terminal deletions; no chromatid breakages were seen and non sister reunion was rare. The near-terminal regions of the chromosome arm were very susceptible to damage while the mid-arm regions were resistant and the centromere regions moderately susceptible, with a random or near-random distribution of damage between arms. The distribution of breaks between cells in any one seed shows overdispersion, greater in the aged seeds, as compared with the Poisson distribution. The overdispersed distributions could in both cases be fitted with a high degree of efficiency by the negative binomial. "It is suggested that these similarities in pattern of breakage induced by very different agents indicate a similar chemical basis for the induction of breakage. In particular, the evidence indicates that the initial sites of ionization after X-irradiation interact, presumably by the production of mutagenic substances or radicals which have a definite half-life within the cell, during which time they can diffuse in both time and space. A 'contagion' model based on cumulative action is proposed to explain the negative binomial distribution".

4792 Davidson, D.
The effects of chelating agents on cell division.
Exp. Cell Res. 1958 : **14** : 329–32.

Root tips of *Allium cepa* were treated with solutions of the chelating agents ethylenediaminotetraacetic acid (EDTA) and quinaldinic acid. The effects of treatment of up to 24 hr. duration were similar for both compounds, sticky chromatid bridges at anaphase, swollen chromosomes at metaphase and mitotic inhibition being observed; there was no chromosome breakage. Arrested metaphases and other abnormalities were seen after treatment for longer periods with 0·001 M solutions of EDTA. Transfer to 0·001 M solutions of $CaCl_2$, $MgCl_2$ or NaCl after 48 hr. treatment with EDTA produced no change in the effects of treatment with EDTA.

Flowering shoots of *Tradescantia paludosa* were also treated with the chelating agents; the first effects were similar to those observed in the *Allium* roots and in addition ring-shaped telophase nuclei were noted and the products of meiosis in pollen mother cells included binucleate or quadrinucleate cells. Breakage of chromosomes occurred after six to seven days treatment; the occurrence was sporadic. It was concluded that the chelating agents do not have the same specific action *in vivo* as *in vitro* and their effects on living cells may not be the result of the inactivation of particular cations.

4793 DAVIS, E. W.

Male-sterility in onion plants from Turkey.

J. Hered. 1958 : **49** : 31–32.

Data are presented indicating that a number of introductions from Turkey have a recessive gene for male sterility. PI204789 had the *ms* gene and either *N* or *S* cytoplasm.

4794 BANGA, O. & PETIET, J.

Breeding male sterile lines of Dutch onion varieties as a preliminary to the breeding of hybrid varieties.

Euphytica, Wageningen 1958 : **7** : 21–30.

By means of test crosses to American male-sterile varieties, *N msms* plants were identified in the Dutch onions Primeur and Wijbo. As the results of 14 man-days of searching in commercial seed plots of Primeur and Wijbo, 92 male-sterile individuals were discovered. A male-sterile line of Primeur, based on *S msms* and *N msms* components, has been distributed to breeders for use in developing F_1 hybrids. Tests of the combining ability of ordinary Primeur in intervarietal crosses indicated that the best results are likely to be obtained from combinations with varieties adapted to the same ecological conditions. A working scheme is proposed for the production of a male-sterile line of any local variety, provided male-sterile material of some sort is available. A method of recurrent selection is also suggested for the development of parents improved in combining ability and commercial characters for F_1 production. Two groups of plants are selected separately: (1) A, consisting of components A_1 (*Smsms*) and A_2 (*Nmsms*), and (2) B, a variety or selection combining well with A. The A group should be developed into one or a few rather homogeneous lines, so that selection for combining ability may be restricted to group B, the A_1 A_2 line or lines may be maintained by "mutual" pollination instead of pair crossings, and A_1 plants may be used for tests of combining ability, without having to be maintained individually. In each cycle the A_1 and B plants are bagged together in pairs, flies being used as pollinating agents.

4795 GRUN, P.

Plant lampbrush chromosomes.

Exp. Cell Res. 1958 : **14** : 619–21.

In preparations of the anthers of *Allium cernuum*, loop processes were observed on some regions of diplotene chromosomes; these processes were similar to those found on the lampbrush chromosomes of animals. The loops disappeared by diacinesis but some connecting strands between chromosome arms persisted. It is suggested that lampbrush diplotenes and normal fuzzy diplotenes correspond to the same phenomenon expressed in differing degrees.

4796 EID, S. E. ['AID, S.]

Structural hybridity in Egyptian biotypes of *Nothoscordon inodorum* (Ait.) Asch. et Gr. and *Allium myrianthum* Boiss.

Proc. Egypt. Acad. Sci. 1955 : **11** : 91–103.

Evidence was obtained that the chromosomes of *N. inodorum* and *A. myrianthum* have undergone complex structural changes, accumulation of such changes being possible as the result of vegetative reproduction. *N. inodorum* had a complement of $2n = 19$, consisting of 13 metacentrics and 6 telocentrics. In some cells all 19 chromosomes were involved in one association. *A. myrianthum* had $2n = 32$ or 33 and is believed to have arisen as an autotetraploid.

4797 KECK, K. & HOFFMANN-OSTENHOF, O.

Stoffwechselprodukte von *Allium*-Arten als Mitosegifte. **(Metabolic products of *Allium* species as mitotic inhibitors).**

Cytologia, Tokyo 1956 : **21** : 208–21.

Cold-water extracts were made from bulbs of

several varieties of *A. cepa*. Higher concentrations of such extracts inhibited spindle formation in root-tip cells of the same species and stickiness was often observed. Lower concentrations caused various aberrations and in particular fragmentation. Similar extracts from *A. sativum* in high concentrations were extremely toxic to root-tip cells of *A. sativum* and *A. cepa*; lower concentrations caused no aberrations in *A. sativa* but produced frequent chromosome breaks in *A. cepa*.
Highly concentrated solutions of diallyl disulphide, a component of *Allium* oil, induced c mitoses in root-tip cells of *A. cepa*; these c mitoses differed to some extent from those caused by *Allium* extract. Low concentrations of diallyl disulphide caused considerable chromosome fragmentation and other aberrations in *A. cepa*. It was concluded that diallyl disulphide is only partly responsible for the effects of *Allium* extracts on mitosis. Diallyl monosulphide had no such activity. A tendency to form double chromatid fragments was noted in these studies of *Allium* and this was understood to arise from isochromatid breaks. No pseudochiasmata were recognized.

4798 HASITSCHKA-JENSCHKE, G.
Zur Karyologie der Samenanlage dreier *Allium*-Arten. (**On the caryology of the ovule of three *Allium* species**).
Öst. bot. Z. 1958 : **105** : 71–82.

Ovule development in *A. pulchellum*, *A. ammophilum* and *A. angulosum* is described, being generally similar to that of *A. ursinum* [cf. XXVII, 4539]. Endomitosis occurred in one or more of the antipodal or synergidal cells in all three species, giving rise to octoploid nuclei in *A. pulchellum* and *A. angulosum*. In *A. ammophilum*, the daughter chromosomes of the highly polyploid nuclei were arranged in bundles described as giant chromosomes.

4799 ISHII, K.
(**Cytological studies on *Asparagus* plants. II. On the affinities of some *Asparagus* plants as revealed by the caryotypes**).
Nihon Daigaku Nojuigakubu Gakujutsu Kenkyu Hokoku/Bull. Coll. Agric. Vet. Sci. Nihon Univ. 1957 : No. 7 : 30–35. [Japanese].

A comparative study of chromosome morphology in *A. officinalis* 'California 500', *A. schoberioides*, *A. lucidus* and *A. myriocladus* is reported. In all species $2n = 20$. *A. pygmaeus* and *A. schoberioides* are believed to have originated from *A. lucidus*.

4800 TOKUMASU, S.
A case of sterility in *Brassica japonica* L.
Mem. Ehime Univ. : Sect. VI : 1958 : **3** : 151–56.

A mutant in which the pistil is not functional as the result of longitudinal splitting of the style is described. Many of the plants with this abnormality set no siliquas, whereas others set some siliquas containing no or only a few viable seeds. The abnormality is controlled by a recessive gene, *sp*.

4801 NATTI, J. J.
Resistance of broccoli and other crucifers to downy mildew.
Plant Dis. Reptr. 1958 : **42** : 656–62.

Inoculation with *Peronospora parasitica* at the cotyledonary stage provided a rapid method for distinguishing highly resistant seedlings from moderately resistant and susceptible ones. A fleck reaction with no sporulation occurred on highly resistant seedlings. Inoculation of seedlings with three or four leaves offered an effective means of distinguishing moderately resistant individuals from susceptible. In greenhouse tests, commercial varieties of different types of *Brassica oleracea* crops, with the exception of kale, were susceptible to a race of the pathogen occurring in New York State. Varieties of mustard, rape, Chinese cabbage and turnip were resistant. Radish varieties proved to be immune. All plants of introduction PI231210 of broccoli were highly resistant. This introduction has been crossed with the broccoli Waltham 29. Resistant seedlings were found among seven introductions of cauliflower. In field tests, differences in resistance were observed among commercial varieties of broccoli but no variety was highly resistant.

4802 FAN, H.-C. & KO, C.
(**An evaluation of mosaic virus of Cruciferous vegetables in the Canton district and its vicinity**).
Chih-wu Ping-li-hsueh Pao (J. Pl. Path.)/ Acta phytopath. sin. 1957 : **3** : 155–68. [Chinese].

A collection of 77 mosaic-virus isolates from varieties of *Brassica* spp. and *Raphanus sativus* grown in the above area has been classified into four strains, two pertaining to *Brassica* virus 2 and two to *Cucumis* virus 1.

4803 ACOSTA, J. C., DIMAS, A. & CADIZ, T. G.
Comparative studies of cabbage varieties in Nueva Ecija, Mountain Province, and Laguna.
Philipp. Agric. 1957 : **41** : 392–401.

In trials of varieties, obtained from the United

States, Japan and Europe, at low and high elevations in the Philippines, O–S Cross, from the USA, gave the best results at both elevations. The performance of the varieties is discussed and the yields and vigour at the different localities tabulated.

4804 Avakjan, A. A.
(The biological nature of intraspecific graft chimeras).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 423–35. [Russian].

Intraspecific chimeras obtained from shoots arising at the callus of reciprocal graft hybrids of cabbage/red cabbage behaved differently from interspecific chimeras such as tomato/*Datura tatula*. In particular, the intraspecific chimeras were normally fertile and the seed progenies from pollinations within them continued to segregate with regard to pigmentation.

4805 Shibata, K.
(Reverted diploids that appeared in a selfed strain derived from an artificial autotetraploid of *Brassica pekinensis*).
Senshokutai (Chromosome)/Kromosomo 1957 : **32** : 1109–14. [Japanese].

A description is given of the morphology and cytology of three reverted diploids derived from an autotetraploid of genetic constitution $S_1S_1S_1S_1$. Meiosis was normal, pollen fertility being 88·9% in contrast to 84·7% in the tetraploid progenitor and 96·4% in the original diploid. Compatibility tests showed that the reverted plants were of S_1S_1 constitution.

4806 Nieuwhof, M.
Ervaringen op het I.V.T. met de veredeling van spitskool. I. II. **(Experiences in breeding pointed-headed cabbage at the Institute of Horticultural Plant Breeding. I. II.)**
Zaadbelangen 1958 : **12** : 158–59, 173–74.

The first two articles in this series of papers addressed to Netherlands breeders deal respectively with selection and vegetative propagation. It is pointed out that if selection is carried out in summer, estimates of bolting, number of outer leaves and earliness cannot be made or are unreliable; for this reason the importance of using good starting material is stressed. To propagate the selected plants, the mature heads are removed, leaving one leaf on the stalk. Once the axillary buds start growing, the leaf is removed and in August the young shoots are taken as cuttings and rooted. After keeping under glass during the winter the cuttings flower the following summer and can be used for seed production or crossing.

4807 Schuphan, W.
Biochemische Stoffbildung bei *Brassica oleracea* L. in Abhängigkeit von morphologischen und anatomischen Differenzierungen ihrer Organe. Ein Beitrag zur Züchtung von Nahrungsträgern hohen biologischen Wertes. 1. Teil: Vegetative Organe. **(The biochemical formation of substances in *B. oleracea* L. dependent on morphological and anatomical differentiation of its organs. A contribution to the breeding of food producers of high biological value. Part 1: Vegetative organs).**
Z. Pflanzenz. 1958 : **39** : 127–86.

The morphological differences found in various types of *B. oleracea* are described and the results are reported of comparative studies on the nutritional substances found in leaves (with the midribs removed) of wild cabbage, kale, Brussels sprouts, white cabbage and savoy. The inner leaves of white cabbage compared with those of kale had considerably less chlorophyll, carotene, ascorbic acid, Ca, Fe, Cl and S and to a smaller degree less phosphoric acid and Mg. The proportion of protein relative to the total amount of nitrogenous compounds and the content of aminoacids were also lower in the white cabbage but content of sugar, Na and K was higher. Similar differences were found between the axillary buds of Brussels sprouts and white cabbage. When a type of early savoy which forms a head was compared with a non-heading type, the former had smaller quantities of nutrients in the leaves. The exclusion of light and air from the inside of a large terminal bud such as that of white cabbage may account for the inferior food value of the leaves. Cross sections of stems of kale, marrow stem kale, white cabbage and kohl rabi showed in that order an increase in monosaccharides and ascorbic acid accompanied by a decrease of dry matter and disaccharides; the midribs of the leaves were similar in these respects.

Having pointed out the high nutritional value of kale leaves the author suggests that attempts be made to improve the productivity of kale by breeding for increased branching of the stems; some frost-hardy varieties are listed as suitable breeding material. As regards Brussels sprouts, it is considered worth while to breed varieties productive of both foliage and lateral buds; in order to use the leaves frost-resistant varieties must be bred. It is not considered possible to improve the nutritional value of white, red and Savoy cabbages without diminishing other desirable properties. Since the leaves of kohl rabi are more nutritious than the stems, it is thought that greater attention should be given to breeding varieties with abundant foliage; such a variety was grown in the 16th century. Breeding for a low content of mustard oil would render all Brassica types more palatable and digestible.

4808 MOJA, A.
Identificazione precoce di caratteri genofenotipici in *Brassica oleracea* var. *Sabauda* DC. (**Early identification of genophenotypic characters in *B. oleracea* var. *Sabauda* DC**).
Ann Fac. Agr. Milano 1955 : **4** : 269–82.

The data presented show that Savoy cabbages in which one quarter of the head had been cut out for morphological examination suffered less reduction and delay in flowering than those in which half the head had been removed. The former category produced more seed even than the controls, giving 16·7 g. per plant as opposed to 15·2 g. in the controls; the size and germinating capacity of the seeds was also greater. Plants that had been entirely decapitated produced 14·2 g. of seed per plant. By transplanting cabbages from which the heads had been cut, only 17% of the plants were induced to form seeds the following year and the mean seed yield per plant was 7·76 g.

4809 FINCH, C. G.
Winter cauliflower trials in the south-west, 1953–1957.
J. nat. Inst. agric. Bot. 1957 : **8** : 143–63.

Information is provided on times of heading, yield, head quality and other features of 21 varieties grown in trials in Cornwall, Devon and Hampshire, England.

4810 SHEPHERD, F. W. & WOOD, P. D.
Varieties of winter cauliflower at Rosewarne, 1952–1955.
J. nat. Inst. agric. Bot. 1957 : **8** : 135–42.

Stocks studied at the Rosewarne Experimental Horticulture Station, Cornwall, England, were classified into five main types: Angers, Cornish, English Hardy, Italian and Roscoff. Only varieties of the Roscoff type are considered to be entirely suitable for Cornish conditions.

4811 WATAHARA, T.
(**Cauliflower varieties**).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 532–36. [Japanese].

Cauliflower and heading and sprouting broccoli varieties grown in Japan are classified into seven groups and the botanical and agronomic characteristics of these groups are indicated. A few of the varieties are Japanese but most are introductions from England or the USA.

4812 Der Spinat (*Spinacea oleracea*) Geschichtliches und Züchterisches. [**Spinach (*S. oleracea*) history and breeding**].
Saatgutwirtschaft 1958 : **10** : 69–70.

A short German version is provided of papers by Sneep summarized elsewhere [cf. 4813].

4813 SNEEP, J.
The present position of spinach breeding.
Euphytica, Wageningen 1958 : **7** : 1–8.

This is a shortened version of the detailed survey already published on spinach breeding in the Netherlands. [3478].

4814 HUYSKES, J. A.
Het kweken van zwaardere glasslarassen. (**Breeding heavier greenhouse varieties of lettuce**).
Meded. Dir. Tuinb. 1958 : **21** : 210–13.

At the Netherlands Institute of Horticultural Plant Breeding, some greenhouse lettuces have been crossed in an attempt to breed varieties with heavier heads. Some good types occurred in the segregating F_2 and selfing and selection are continuing.

4815 REGGIANI, F.
Nuovi tipi di insalata. (**New types of salad vegetables**).
Frutticoltura, Bologna 1958 : **20** : 165–66.

Two new strains of lettuce and five of endive are briefly described. Both lettuce strains, 214–Z and 217–Z, have large heads, the former with pale green leaves. 214–Z matures about 150 days after sowing and 217–Z is described as maturing early. Of the endive varieties 1,54–Z has a semierect habit while the others are all prostrate or semiprostrate. Two of them, 13/022–Z and 15/028–Z, are resistant to *Sclerotinia sclerotiorum*, the resistance of the former being somewhat better. 13/022–Z is also resistant to cold, as is 18/041–Z, while 15/028–Z possesses good transporting quality; 9/010–Z is characterized by its large size.

4816 Das Erkennen verschiedener Salatsorten an der jungen Pflanze. (**The recognition of different lettuce varieties in the young plant**).
Saatgutwirtschaft 1958 : **10** : 130–32.

Information taken from an article by C. M. Rodenburg is presented on the distinguishing characters of young plants of some lettuce varieties grown in Holland.

4817 WATTS, L. E.
Natural cross-pollination in lettuce, *Lactuca sativa* L.
Nature, Lond. 1958 : **181** : p. 1084.

Using a dominant gene for anthocyanin pigmentation as marker, intervarietal cross pollination occurring naturally under conditions at the National Vegetable Research Station, Wellesbourne, England, ranged from 0·15 ± 0·009 to 11·52 ± 2·749%. The percentage was higher, the later the flowering period, probably as the result of a rise in the hover-fly population later in the season.

4818 HONMA, S.
Progress report on celery varieties.
Quart. Bull. Mich. agric. Exp. Sta. 1958 : **40** : 535–38.

Twenty-three old and new varieties and strains were tested during 1957 at the Michigan State University Muck Experimental Farm near East Lansing. For weight per stalk and petiole length, 52–70H surpassed all other entries. It also gave the highest yield per acre but its superiority in this respect was not significant.

4819 JURINA, O. V.
(The grafting of pollinated flowers of the melon upon the pumpkin).
Selekcija i Semenovodstvo (Breeding & Seed-growing) 1957 : No. 6 : 68–71. [Russian].

Gribovo 13 and some other melon varieties were grafted on *Cucurbita pepo*, *C. moschata* and *C. maxima* x *C. moschata* at Gribovo. Changes were observed in the fruit characters of the scions and in economic characters in the first seed generation. Some plants among the sexual progeny were twice as productive as the initial melon variety and had sweeter fruits with improved keeping properties. Breeding work with selected material is in progress.

4820 NAZAROV, S. A.
(Viewing the cucurbits at the USSR Agricultural Exhibition).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 4 : 39–42. [Russian].

Among the exhibits were new varieties of melon and water melon bred at various Soviet institutes. The melons included Bronzovka K3 [Bronze K3] and Doč' Kolhoznicy [Collective Farmer's Daughter] from Birjučij Kut; they have a sugar content of 12% and the first-mentioned variety keeps and transports well. The water melon Kuban' 103 from Krasnodar outyields Birjučij Kut 775, has a 10% sugar content and produces fruits weighing up to 8 kg. Dynnyj List [Melon Leaf] from Birjučij Kut and some of the other new water melons are characterized by a high sugar content and good flavour. Bykovo 6 is mentioned for its earliness and Bykovo 7 for good transportability.

4821 REID, J.
Studies on the fusaria which cause wilt in melons. I. The occurrence and distribution of races of the muskmelon and watermelon fusaria and a histological study of the colonization of muskmelon plants susceptible or resistant to fusarium wilt.
Canad. J. Bot. 1958 : **36** : 393–410.

Studies were made of 290 isolates of *Fusarium bulbigenum* var. *niveum* from musk melon and 99 isolates from water melon, the isolates being obtained from Ontario melon fields. Descriptions are provided of nine isolates of musk melon wilt which differed morphologically from a standard culture and mention is made of 20 other different races. Only 18 of the water melon races were similar to a standard culture. Differences in pathogenicity between the cultural races were demonstrated by testing 101 isolates on the musk melons Benders' Surprise and Iroquois and on Peerless water melon. A series of varieties and hybrids of musk melon were observed in a field in which six races of musk-melon wilt were present. The melon varieties did not show the same degree of susceptibility in two successive years and these results were probably related to yearly variation noted in the relative abundance of the different races. A study was made of the colonization by wilt of the resistant variety Iroquois and the susceptible Benders' Surprise; the development of the fungus was slower and less extensive in the resistant variety. The restriction of development was not found to be due to any mechanical barrier and all attempts to extract an inhibitory substance from Iroquois plants failed.

4822 VAKULIN, A. A.
(Develop more widely the culture of cucurbits on sandy soils).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 2 : 39–41. [Russian].

Standard varieties of melon, water melon and pumpkin in the province of Stalingrad which has sandy soil, are listed. Mention is made of Volga 7, a new water melon from the Bykovo Cucurbit Research Station. It outyields the high-yielding variety Melitopol' 142 and keeps up to five months.

4823 Swaminathan, M. S. & Singh, M. P.
X-ray induced somatic haploidy in watermelon.
Curr. Sci. 1958 : **27** : 63–64.

One of the plants raised from seeds which had been treated with 48,000 r. had a haploid branch ($2n = 11$). The branch was morphologically similar to the diploid branches, except for its smaller leaves and flowers and thinner stem and petioles. The origin of the branch is ascribed to reductional mitosis. Configurations at metaphase I in 14 cells were 11_{I} in 7, $9_{\text{I}} + 1_{\text{II}}$ in 5 and $7_{\text{I}} + 2_{\text{II}}$ in 2 cells. A marked tendency towards secondary pairing among the univalents was observed in some microsporocytes, the maximum degree of such association being found in a cell with one group of 3 chromosomes, two groups each consisting of 2 chromosomes and 4 single univalents. The observations on primary and secondary pairing are discussed in relation to the problem of the basic number of the species.

4824 **Two new watermelons.**
Agric. Res., Wash. 1958 : **6** : No. 8 : p. 16.

The water melons Blackstone [cf. XXVII, 4559] and Garrisonian have been developed at the USDA Southeastern Vegetable Breeding Laboratory, Charleston, SC. In addition to giving high yields of good-quality fruits with hard rinds, they are resistant to anthracnose. Their fruit weights are respectively 28–34 and 40–60 lb.

4825 Semerinova, A. G.
(How to obtain early produce from cucurbits).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 3 : p. 35. [Russian].

The use of transplanted material and early varieties such as Rannij 6 [Early 6] as a means of improving earliness of water melons in the province of Stalingrad is discussed. Mention is made of two new late varieties from Bykovo, Volga 7 and Bykovo 23. The former outyields all other varieties at Bykovo and has fine flavour and good keeping properties. Its transportability is good and it is resistant to *Fusarium*. The other new variety also keeps and transports well and has excellent flavour.

4826 Weiling, F. & Schagen, R.
Über die Ursachen des Auftretens tauber Samen bei Ölkürbis (*Cucurbita pepo* L.).
[On the causes of the occurrence of hollow seed in the oil pumpkin (*C. pepo* L.)].
Gartenbauwiss. 1958 : **23** : 87–101.

Progenies of four mother plants differing in their percentage production of hollow seed were studied. In some fruits (A types) the hollow seeds were distributed uniformly and in other fruits (B type) the distribution was irregular; the A fruits had a lower percentage of hollow seeds. The proportion of A type fruits produced by one line was almost twice as great as that found in the other three lines.

The production of hollow seeds in B type fruits was mainly due to changing weather conditions which resulted in early abortion of the embryos. In some of the A type fruits it was found that not all the ovules were fertilized; this was due to either an early disturbance of ovule development or to the inability of the ovules to attract pollen tubes. Cytological investigation of the ovules was not possible on account of their small size and the difficulty of staining them. In pollen mother cells however, univalents and polyvalents were observed during meiosis, quadrivalents being quite frequent; bridges and fragments were also noticed. The proportion of sterile pollen produced was small. It is thought that the basic chromosome number of the Cucurbitaceae is $n = 5$ or thereabouts.

4827 Peterson, C. E. & Weigle, J. L.
A new method for producing hybrid cucumber seed.
Quart. Bull. Mich. agric. Exp. Sta. 1958 : **40** : 960–65.

The Korean variety Shogoin (PI220860) produces monecious plants and also segregates in which all the flowers are female. Its gynomonecious habit has been incorporated into lines of the pickling cucumber Wis. 18–7. In producing hybrid seed, the gynomonecious line used as ♀ was planted adjacent to a monecious variety. At about the 10-node stage, the monecious and intermediate plants were rogued in the gynomonecious line. Under conditions at Fort Collins, Colo., the lines produced fewer female plants than at East Lancing, Mich. The incidence of female plants was however sufficiently high in both localities to make the production of hybrid seed feasible.

4828 Kao, P.–L.
(Preliminary results of experiments on the breeding of cucumber hybrids).
Pei-ching Nung-yeh Ta-hsueh Hsueh-pao/Sci. Rep. Peking agric. Univ. 1957 : **3** : 39–46. [Chinese].

Attempts to hybridize cucumbers and *Luffa cylindrica* failed. Hybrids were obtained, however, from (Pien cucumber/*L. cylindrica* x Pien + *L. cylindrica*) x Pien + Ta-tzu [Large-spined] cucumber; these showed improvements over the parent cucumber varieties in respect of yield and resistance to *Pseudoperonospora cubensis.*

4829 GONTJUROV, I. M.
(The cucumber variety Avant-garde 121).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. 4 : p. 42. [Russian].

This variety was bred at the Far Eastern Branch of the Institute of Plant Industry. It ripens 5–7 days earlier than Dal'nevostočnyj 6 [Far Eastern 6], is resistant to mildew and soft rot and produces 250 c. fruit per ha. The fruit has good flavour whether fresh or pickled.

4830 AALDERS, L. E.
Monoploidy in cucumbers.
J. Hered. 1958 : **49** : 41–44.

For what is believed to be the first time haploid plants are reported in the Cucurbitaceae. It appears, from the experiments described, that haploid cucumber plants are only obtained from seeds which float in water and which contain embryos four to six millimeters long; it is thought that these haploid embryos cannot develop unless they are cultured artificially. No diploid progeny were obtained by colchicine treatment from eight haploid plants which grew to maturity.

4831 ITO, H. & SAITO, T.
(Studies on the conditions controlling the differentiation of female, male and hermaphrodite cucumber flowers. VIII. The influence of long days and high night temperature treatments of short duration at the seedling stage, plus hormone spraying, on the sex of the flowers).
Engei Gakkai Zasshi/J. hort. Ass. Japan 1957 : **26** : 209–14. [Japanese].

Spraying with a 10 p.p.m. solution of α-naphthaleneacetic acid promoted the formation of female flowers even under long photoperiods and with high night temperatures, conditions which otherwise favour the differentiation of male flowers [cf. XXVIII, 3488].

4832 PETERSON, C. E. & RIES, S. K.
The evaluation of pickling cucumber varieties for Michigan.
Quart. Bull. Mich. agric. Exp. Sta. 1958 : **40** : 932–41.

Data obtained on yield and processing quality as the results of tests over a four-year period are reported. Wisconsin SMR–12 appeared to be the most widely acceptable variety, on account of its resistance to scab and mosaic, satisfactory yield and fairly light colour when salted. Other new varieties meriting trial by growers were Wis. SR–6, Nappa 63, Wis. SMR–18 and Wis. SMR–15.

4833 VAN DER KROFT, W. G.
Achttien jaar onderzoek in de augurkenteelt. **(Eighteen years of investigations on cucumber production).**
Meded. Dir. Tuinb. 1958 : **21** : 266–76.

An account of the development of the mosaic-resistant variety Guntruud from crosses between Baarlose Nietplekker 6 and Tokyo Long Green and of the use of Guntruud in crosses with the south-east Asian variety Barnas, which is highly resistant to *Glomerella lagenaria*, is included in this article on cucumber production in the Netherlands.

4834 VAN ES, J.
Bladvuurresistentie bij komkommers. **(Blotch resistance in cucumbers).**
Zaadbelangen 1958 : **12** : 116–17.

Crosses between Spotvrije, which is resistant to *Corynespora melonis*, and the susceptible variety Esvier, indicate that resistance is controlled by a single dominant factor. Testing may be carried out by inoculation in the seedling stage after testing for resistance to *Cladosporium fulvum.*

4835 Forsøg med sorter af tomater i væksthus 1955–56. **(Trials of tomato varieties in the greenhouse, 1955–56).**
Tidsskr. Planteavl 1958 : **62** : 169–72.

The above trials, conducted in Denmark, included seven varieties of which the F_1 hybrids Ware Cross and Hertford Cross were best in quality. In preliminary trials of new varieties, the three F_1 hybrids Reverdan T_2, Atocross and Danimuna have shown promise in yield of top-quality fruits.

4836 NAKAGAWA, H. & UEMURA, S.
(Investigations on the tomato varieties suitable for cultivation without support).
Nogyo oyobi Engei/Agric. and Hort. 1956 : **31** : 592–94. [Japanese].

Trials of Japanese and American varieties grown without staking are reported. Data are provided on the lengths of the main and lateral stems and on the yield and incidence of disease of the fruit.

4837 TRONIČKOVÁ-POLÁKOVÁ, E.
Využití heterosis u rajčat. **(Utilizing heterosis in tomatoes).**
Věd. Práce výzk. Ústav. rostlin. Výrob. 1957 : **3** : 125–56.

Tabulated information showing the degree of heterosis in a series of hybrids studied at Ryzyně is presented. Some hybrids showed appreciable improvements in earliness and yield. Marked earliness was observed in hybrids involving Průhonice Universal, Immun or Gruntovyj Skorospelyj [Outdoor Early] while the highest yields were obtained from hybrids of Stupické Polní Rané [Stupice Early Field], a variety derived from *Solanum racemigerum.* Among the best hybrids combining earliness with high yield were Stupické Polní Rané x Condine Red, Stupické Polní Rané x Slava Porýné [Rhineland Glory] and Průhonice Universal x Vrbičanské Nizké [Short Vrbičany].

4838 Butler, L. & Chang, L. O.
Genetics and physiology of the xanthophyllous mutant of the tomato.
Canad. J. Bot. 1958 : **36** : 251–67.

"Xanthophyllous is a dominant yellow-leafed mutant; the genotype *Xa Xa* is lethal in either the seed or the very early seedling stage, while the genotype *Xa xa* is viable but reacts differently to light intensity than does the normal *xa xa* plant. The 1 : 2 : 1 ratio is never realized because less than half the lethals appear as seedlings. The 2 : 1 ratio is affected by germination so that under good conditions for germination a 2 : 1 ratio is obtained, but under poor conditions the ratio may approach 1 : 1. Maximum likelihood formulae are given for calculating linkage when one gene is a dominant with recessive lethal effects, and it is shown that the simple product moment method gives similar results for these data. *Xa* is in linkage group VII (chromosome 10), and its lethal effect disturbs the monogenic ratios of all genes in this group. The following crossover values between these genes and *Xa* are found: *H* 44·5%, *pe* 50%, *t* 35·5%, t^v 31·7% and *ag* 46·5%.

"Under standard growing conditions the pigment concentrations of xanthophyllous contrasted with green is: chlorophyll, 790 instead of 3240 μg./g.; xanthophyll, 54 instead of 211 μg./g.; and carotene, 60 instead of 130 μg./g. Both green and yellow plants, when grown under various intensities and spectral compositions of light, have different responses. Green plants make only limited response to changes in light intensity, whereas *Xa xa* plants become green and cannot be distinguished from *xa xa* plants. From 600 to 8000 ft.-c. the *Xa xa* plants show a linear trend of decreasing pigment (increasing yellowness) with increasing light intensity. The hypothesis is advanced that *Xa xa* plants make as much pigment as do green ones, but a light-dependent reaction breaks down the pigments faster than they are being formed." [Authors' summary].

4839 Kác, V.
Vyšlechtění determinantního rajčete a studium agrotechniky pro keřové odrůdy. **(Breeding a determinate tomato and studying agricultural methods for bush varieties).**
Sborn. vysok. Šk. zeměd. Praze 1956 : 153–62.

This article deals mainly with cultural measures, but mentions a new early variety with a high proportion of marketable fruits having a dry-matter content of 3·8–4·2% and good flavour.

4840 Ragazzi, G.
La coltura del pomodoro in Italia. **(Tomato cultivation in Italy).**
Riv. Ortoflorofruttic. ital. 1958 : **83** : 7–20, 127–48.

The first part gives an outline of the botanical characteristics of the tomato, its introduction into cultivation and its present importance in Italy. In the second part descriptions are given of cultivars suitable for the production of fresh fruit at different seasons of the year, starting with the very early Rosso primaticcio [Early Red] from Ficarazzi in Sicily and finishing with Manalucie. Other groups described are those suitable for producing concentrates, for peeling and for keeping through the winter. The cultivars mentioned include old Italian varieties, more recent hybrids and some varieties introduced from the USA and other countries, indications being given of their origin in every case. Many of the older varieties are impure and indications are given of how they can be improved by selection, the methods of seed production used in maintaining the quality of a variety being outlined.

4841 **New tomato variety developed.**
RI Agric. 1958 : **4** : No. 2 : p. 3.

Developed at the Rhode Island Agricultural Experiment Station, Rhode Island Early [(Earliana x Victor) x Danmark] has the indeterminate habit and fruits which are globe-shaped, red, firm and slightly acid in flavour. It ripens in 58 days after transplantation, following 36–42 days in the greenhouse. The variety has also given a good performance in other northern states and in Canada.

4842 Porte, W. S. & McFerran, J.
Pinkshipper: pink-fruited, fresh-market tomato.
Sth. Seedsman 1958 : **21** : No. 3 : 26–27.

Designed for commercial-scale growing, this variety, from (Gulf State Market x Pan America) x (Marvelosa x Marglobe), is characterized by high resistance to *Fusarium oxysporum* f. *lycopersici*. It gives good yields of high quality scarlet-red fruit, with five to nine locules and thick walls, and it matures about 75 days after transplanting.

4843 ALEXANDER, L. J.
New Jubilee tomato good producer.
Ohio Fm. Home Res. 1958 : **43** : 23, 31.

This new variety, produced by the Ohio Agricultural Experiment Station, combines resistance to *Fusarium* wilt and grey leaf spot. Developed from a derivative of Rutgers crossed with Ohio W–R Brookston it gives higher yields than Rutgers and is slightly earlier. Jubilee is particularly suitable for processing since in quality it resembles Rutgers but has more flesh. It is susceptible to cracking.

4844 GOTTSCHALK, W.
Über Abregulierungsvorgänge bei künstlich hergestellten hochpolyploiden Pflanzen. (**Chromosome diminution processes in artificially produced highly polyploid plants**).
Z. VererbLehre 1958 : **89** : 204–15.

Meiosis in pollen mother cells of octoploids of the tomato variety Immun was studied. Three kinds of abnormal division were observed resulting in the production of: (1) eight haploid gones; (2) one diploid and one hexaploid and (3) two diploids and one tetraploid. The chromosome numbers of the daughter nuclei did not always correspond exactly to multiples of the haploid number. Two or three nuclei were present in the pollen mother cells during early meiotic prophase and these nuclei then underwent normal meiosis. A reduction division is thought to have occurred before meiosis.

Similar irregular divisions of the nucleus were found in several autotetraploid tomatoes.

4845 GOTTSCHALK, W.
Untersuchungen zum Problem der Herabregulierung der Chromosomenzahl in experimentell erzeugten polyploiden Pflanzen. (**Investigations on the problem of the reduction of the chromosome number in experimentally produced polyploid plants**).
Z. VererbLehre 1958 : **89** : 52–79.

Plants of *Lycopersicon esculentum* 'Immun' [Immune] with chromosome numbers ranging from $2n = 45$ to $2n = 53$ were obtained by germinating tetraploid seed on agar + colchicine; the chromosome numbers varied in inflorescences on the main and side shoots of these polyploids. From a small percentage of the tetraploid pollen mother cells, haploid cells were produced by either a separation of the chromosomes into $n + 3n$ groups or into $2n + n + n$ groups during the first meiotic telophase. In tetraploid anthers, some triploid pollen mother cells occurred and these gave n and $2n$ cells. Some diploid pollen mother cells and others with $2n$ varying between four and 46 were also found; in these cases, bivalents were usually formed and multivalents were hardly ever observed during diacinesis. In most cases meiosis resulted in the distribution of complete genomes to the daughter cells.

4846 GÜNTHER, E.
Versuche zur vegetativen Annäherung von Tomaten und anderen Solanaceen. (**Experiments on vegetative rapprochement of tomatoes and other Solanaceae**).
Z. Pflanzenz. 1958 : **39** : 325–38.

Eleven species of the subgenus *Eusolanum* and one of *Physalis* were grafted on to a series of tomato varieties and the emasculated flowers were then pollinated by the scion. No fruits containing seed were obtained and further experiments using only *S. pseudocapsicum* as the scion produced five seeds, none of which germinated. In similar experiments it was found that vegetative rapprochement produced no improvement in fruit set or production of viable seed in crosses between tomato and *Lycopersicon hirsutum* or *L. peruvianum*; repeated grafting also had no effect. Abnormal development of the endosperm was found to be a cause of failure in these crosses.

4847 YOUNG, H. W.
Inheritance of fruit cracking in a *Lycopersicon esculentum* cross.
Diss Abstr. 1957 : **17** : Publ. No. 22,831 : p. 2129. (Abst.).

In the cross between Alabama 10–1 and a crack-susceptible strain of Marglobe, resistance to radial cracking depended upon recessive genes at two major loci, respectively designed *Cr* and *Rc* and assigned to linkage groups IV and III. Resistance to radial cracking was associated with low incidence of concentric cracking, pink fruit, high number of fruits per plant, low number of locules per fruit, small fruit diameter and semideterminate habit. Inheritance of locule number was ascribed to a single pair of genes (*Lolo*). The mild type of concentric cracking found in this cross exhibited a heterotic effect. It was associated with indeterminate habit, uniformity in the colour of the unripe fruits, low number of fruits per plant, resistance to the radial and burst types of cracking, and small fruit diameter. Resistance to the burst type was determined by recessive genes at two major loci respectively designated *Bt* and *Bg* and belonging to linkage groups III and VII. *Bt* had a greater effect than *Bg*. Low incidence of bursts was associated with uniform colour of the unripe fruits and low frequency of concentric cracks.

4848 BAYRAKTAR, A. K.
Sebze bahçelerinde yetiştirilen yerli ve Amerikan domates çeşitlerinin özellikleri ve teknolojik değerleri üzerinde mukayeseli araştırmalar. **(Comparative investigations on the characters and technological value of local and American tomato varieties cultivated in vegetable gardens).**
Zir. Fak. Yayınl. 1953 : **42** : No. 17 : Pp. 356.

The investigations described were carried out during 1948 and 1949 with 59 tomato varieties cultivated in Turkey; these included local and foreign varieties. Information is presented on phenological, physiological and technological characters and floral biology of these varieties. A number of varieties are said to have fruit of first class quality and others were found suitable for pulp production; some high yielding varieties are also listed. All the varieties tested were said to have an 89% fruit set after selfing but after cross pollination the flowers withered without forming fruits.

4849 PUTTER, J., LOEBENSTEIN, G. & SLOMNICKI, I.
Determining sample size in field experiments with tomatoes.
Ktavim, Rehovot 1958 : **8** : 21–23.

In varietal trials of tomatoes being tested for sauce production, the optimum layout involved 7 replicates of 15 plants each.

4850 ŠIHOV, L. I.
(A method of growing tomatoes without transplanting).
Sad i Ogorod (Gdn. & Veg. Gdn.) 1958 : No. **3** : 19–21. [Russian].

Varieties suitable for growing in the open under the climatic conditions of Western Siberia have been bred at Gribovo, Puškin and the West Siberian Horticultural Research Station; the seed of other varieties germinates at temperatures of 12°–14° C. and the shoots are tolerant of 3–4° of frost. Gruntovyj Gribovskij 1180 [Outdoor Gribovo 1180] yielded most fruit in trials at Omsk.

4851 GÜNTHER, E. & GRÜMMER, G.
Untersuchungen über die Fruchtfäulen der Tomate. **(Investigations on the fruit rots of the tomato).**
Gartenbauwiss. 1958 : **23** : 130–59.

After describing the symptoms of various tomato fruit diseases, a report is given of varietal trials held in the coastal region of Griefswald, where the climate favours the development of fungous diseases. The data presented include information on the yields obtained in recent years and on the incidence of brown, black and white rots, brown rot being caused by *Phytophthora* spp., black rot by *Alternaria*, *Stemphylium* and *Didymella* spp. and white rot by *Fusarium*, *Phoma* and *Botrytis* spp.; *Ph. infestans* and *A. porri* f. *solani* caused most damage. Frühe Liebe [Early Love] and Fanal were the least attacked by disease of all the varieties from the official list of the German Democratic Republic. Other varieties recommended for cultivation in Griefswald, on account of their disease resistance and relatively sure yield, were Rheinlands Ruhm [Rhineland Glory], Beymes Erntesegen, and Vollendung [Completion]. The forcing variety Atom showed resistance to *Ph. infestans* in a three-year trial and several other foreign varieties were only slightly attacked by this pathogen.

4852 STALL, R. E.
Cytological, cultural, and pathological studies of *Alternaria solani* (Ell. and Mart.) Jones and Grout in relation to heterocaryotic variation.
Diss. Abstr. 1957 : **17** : Publ. No. 21,500 : p. 2398. (Abst.).

Cytological observations indicated that heterocaryosis is possible in the above pathogen. The results of separating different cultural types from four variable cultures demonstrated that genetically unlike nuclei existed in individual cells. Heterocaryons were not however obtained from hyphal tips isolated from intergrown mycelia of dissimilar cultures. Five pathogenic races were differentiated on the basis of the reactions of six *Lycopersicon* hosts.

4853 GILES, J. E. & HUTTON, E. M.
Combining resistance to the root-knot nematode, *Meloidogyne javanica* (Treub) Chitwood, and Fusarium wilt in hybrid tomatoes.
Aust. J. agric. Res. 1958 : **9** : 182–92.

Four tomato lines derived from *Lycopersicon* *peruvianum* were obtained from Hawaii [cf. XXIII, 3085 and XXVII, 4590] for this breeding programme and crossing and back crossing was carried out using these lines and a number of Australian commercial varieties in Victoria. Selection was carried out on the basis of nematode and wilt resistance and agronomic characters. The reaction of the selections to *Fusarium bulbigenum* var. *lycopersici* indicated that resistance was determined by more than one gene, resistance being almost completely dominant. The progeny of plants selected for nematode resistance in the field were highly resistant to *Fusarium* in greenhouse tests. Some indication of interaction between the pathogens within the plants was obtained. In field tests those plants with HES3963 or HES4242 in their ancestry showed good resistance to *M. javanica* and it was found that nematode larvae enter the roots of both resistant and susceptible plants but very few develop into females in the resistant plants. The mode of inheritance of resistance is not clear but it is known that resistance is not absolute and it has also been found that growing the same variety for several years in the same field results in a gradual breakdown of resistance, due to the selection and multiplication of nematode strains capable of infecting it. It has been possible to combine resistance to both pathogens with desirable agronomic characters.

4854 Li, C.-L.
(Observations on giant cells induced in tomato roots by *Meloidogyne hapla*).
Chi-wu-hsueh Pao/Act. bot. sin. 1957 : **6** : 194–200. [Chinese].

Cytological anomalies, in particular nuclear fusion, observed during the development of giant cells following invasion by *M. hapla* are described.

4855 Holmes, F. O.
A single-gene resistance test for viral relationship as applied to strains of spotted-wilt virus.
Virology 1958 : **5** : 382–90.

Single gene resistances to virus diseases seem to be specific for single viruses or strains of viruses. By reference to the literature and in particular the work of Holmes and Finlay on the inheritance of spotted wilt virus in tomato [cf. XXVIII, 3502 and XXIII, 1569 respectively], it is shown how single gene resistances have been used to identify related viruses occurring in different continents.

4856 Tsu, T.-M. & Chao, Y.-S.
A study on the vegetative hybridization of some solanaceous plants.
Sci. sin. 1957 : **6** : 889–903.

[Cf. XXVII, 2388 and 3538].

4857 Armoni, S.
(The egg-plant variety Kabri).
Sadeh (Field)/Hassadeh 1956 : **36** : 1029–30. [Hebrew].

The above variety has proved higher yielding and more disease resistant in Israel than Malkah Shehorah [Black Queen].

4858 Gurgel, J. T. A. & Mitidieri, J.
Estudos sôbre o quiabeiro. II—Efeitos da autofecundação e do cruzamento. **(Studies on okra. II. Effects of self fertilization and of crossing).**
An. Esc. Agric. Queiroz 1955–1956 : **12–13** : 37–51.

The morphology and biology of the flower in *Hibiscus esculentus* are described. A variety named Chifre de Veado [Stag's Horn], obtained from a local grower in the state of S. Paulo in Brazil, was subjected to self pollination for five successive generations and then crossed with an unselected local variety and with the original strain. In respect of number and weight of fruits no significant difference was observed between the six selfed lines and their F_1 crosses with the original variety; the F_1 crosses with the other variety were significantly inferior in both respects.

4859 Gupta, Y. P. & Das, N. B.
Amino-acid content of pure strains of Indian pulses. I. Methionine, cystine and tryptophane.
Ann. Biochem. 1955 : **15** : 75–78.

The content of the above aminoacids was determined in 1–2 varieties of the following species: *Cajanus cajan*, *Cicer arietinum*, *Lathyrus sativus*, *Lens culinaris*, *Phaseolus aureus*, *Ph. mungo*, *Pisum sativum*, *Vicia hirsuta* and *V. sativa*. Intervarietal differences were evident in *Cicer arietinum*, *L. culinaris* and *Ph. mungo*.

4860 Andeweg, J. M. & van Steenbergen, A.
Praktijkproeven met tuinbonen 1955–1956. **(Field tests of broad beans, 1955–1956).**
Meded. Inst. Vered. TuinbGewass. 1957 : No. 104 : 133–39.

The characteristics of the early, midearly and late varieties and selections approved in the above trials at the Wageningen Institute of Horticultural Plant Breeding, Netherlands, are discussed.

4861 Kihlman, B. A.
The effect of oxygen, nitric oxide and respiratory inhibitors on the production of chromosome aberrations by X-rays.
Exp. Cell Res. 1958 : **14** : 639–42.

Lateral roots of *Vicia faba* were irradiated with 100 r. of X rays; in an atmosphere of nitrogen containing 0·1 per cent. oxygen, KCN and cupferron considerably increased the effect of the X rays in producing chromosome aberrations and H_2S and NO had similar effects. Under completely anaerobic conditions, cupferron did not enhance the effect of X rays and it was concluded that the effect of cupferron on the sensitivity of the chromosomes is due to its inhibition of respiration, for it is then possible for even low concentrations of oxygen to reach the nucleus.

4862 Lilly, L. J.
Effects of cyanide and ionising radiation on roots of *Vicia faba*.
Exp. Cell Res. 1958 : **14** : 257–67.

A study of root tip preparations showed that potassium cyanide treatment alone may cause inhibition of growth and mitosis. It increases the number of abnormal anaphases; micronuclei, stickiness, bridges and fragments were observed. These effects were most marked under conditions of high oxygen tension. Beans irradiated in cyanide solution in the presence of nitrogen showed more inhibition of growth and mitoses and more abnormal anaphases than beans irradiated in water with nitrogen present. When the experiments were carried out in the presence of oxygen, the cyanide did not increase the effects of the radiation. Cyanide did not influence the action of α particles on the bean roots. It is suggested that the cyanide forms complexes with heavy metal components of the chromosomes.

4863 Rowlands, D. G.
The nature of the breeding system in the field bean (*V. faba* L.) and its relationship to breeding for yield.
Heredity 1958 : **12** : 113–26.

"1. A cytological examination of natural populations of field beans revealed the widespread occurrence of irregularities during meiosis of a type previously associated with inbreeding depression in an out-breeding species.

"2. The floral mechanism is adapted for cross-pollination and the differential pollen germination and growth in association with a weak incompatibility system suggests the limitation of self-fertilisation.

"3. Under field conditions a major proportion of the seed produced results from self-fertilisation, the inadequacy of insect pollination forcing the plants to self with the consequent poor yield. It is therefore assumed that inbreeding is superimposed on a naturally outbreeding system.

"4. Despite the high degree of self-fertilisation normally encountered in the field, the effect of cross-pollination in contaminating breeding material by other pollen is considerable, thus increasing the difficulties inherent in any bean breeding programme.

"5. Enormous simplification of breeding work in the bean crop would result from the development of a self-tripping, self-fertile line as a basis for subsequent strain building."

[Author's summary].

4864 Landbouwstambonen, 1958. (**Field French beans, 1958**).
Landbouwvoorlichting **15** : Bijl. 28 ; Ber. Rassenkeuze 1958 : No. 245 : Pp. **3**.

Descriptions of the chief characters and the relative yields are given for 16 varieties tested in the Netherlands since 1946.

4865 Veeraswamy, R. & Kunjamma, V. K.
A note on foliar variation in greengram or mung. (*Phaseolus aureus.* L.).
Madras agric. J. 1958 : **45** : p. 151.

A plant bearing leaves with four or five leaflets instead of the usual three was observed in the strain Co.1 at the Millets Breeding Station, Coimbatore. Data on the selfed progeny suggested that the plant was heterozygous for the normal type of leaf, which was recessive to the type with over three leaflets.

4866 Neuheiten für die Branche. (**New varieties for the trade**).
Saatgutwirtschaft 1958 : **10** : 159–60.

Brief descriptions are provided of a series of recent varieties of bean and pea. Multima is a vigorous dwarf bean with white seed and rounded fleshy and stringless pods, which remain tender for a long time. This variety is suitable for canning and for use as a fresh vegetable; it matures after the early varieties Favorit and Saxa. Multima is immune to anthracnose. Unima is another dwarf bean; it is a midlate variety with white and well-shaped seed and long oval pods, which are particularly suitable for use as a fresh vegetable. It is resistant to anthracnose, viruses and halo blight. Delca is a bean suitable for drying and is one of the earliest of its kind. The oval white seed have thin skins and the yield is high; in addition, cooking time is short and palatability is good. Frühstolz [Early Pride] is an early French bean of climbing habit with white seed and pods of good quality. Neckarsegen, another climbing French bean, is midlate, productive and surpasses other stringless beans in resistance to viruses. The pods are long, fleshy and tender. An improvement of the French bean variety Meisterwerk [Master Work] is mentioned which is more healthy and productive than the original variety. Juwagold ohne Fäden [Stringless Juwagold] is an improvement of the variety Wachs Goldbohne [Wax Gold bean]. The pods are 14–16 cm. long, tender, fleshy and palatable. Maiperle [May Pearl] is a particularly early shelling pea, ripening two to three days before Allerfrüheste Mai [May Earliest of All] which is also surpassed in yielding capacity, the pods of Maiperle being longer. Brillant [Brilliant] is a sister variety of Juwel [Jewel] and possesses similar good qualities; the pods are blunt. It is midearly and resistant to *Ascochyta* and "American wilts I and II". Süssschnabel [Sweet Beak] is a garden pea reaching 100–120 cm. in height and also suitable for field cultivation. The maturity period is 72 days and the beak-like pods contain eight to ten seeds which are aromatic and sweet.

4867 CHATTERJEE, P.
The bean root rot complex in Idaho.
Phytopathology 1958 : **48** : 197–200.

Isolates of *Fusarium* (*Hypomyces*) *solani* f. *phaseoli* obtained from root lesions of beans could be separated into three types according to their differences in virulence on Red Mexican beans and growth characteristics. Subcultures of the isolates showed a constancy of behaviour which indicated that the main variations had a genetical basis.

4868 YERKES, W. D. (JUN.).
Additional new races of *Colletotrichum lindemuthianum* in Mexico.
Plant Dis. Reptr. 1958 : **42** : p. 329.

Three new races, MA–11, MA–12 and MA–13, have been identified by means of the five differential Mexican varieties of beans used in previous investigations [cf. XXVII, 2412].

4869 PETERSEN, H.-J.
Beiträge zur Genetik der Reaktion von *Phaseolus vulgaris* L. auf Infektion mit *Phaseolus*-Virus 1 Stamm Voldagsen. (**Contribution to the genetics of the reaction of *Ph. vulgaris* to infection with *Phaseolus* virus 1, race Voldagsen**).
Z. Pflanzenz. 1958 : **39** : 187–224.

Two varieties, Bagnolais and Saxa o.F., which are susceptible to the above virus were crossed with the resistant variety Great Northern UI15 and the hypersensitive variety Topcrop and the latter was also crossed with Great Northern UI15; in each case reciprocal crosses were made. The reaction of some of the F_1, F_2 and F_3 progeny to the virus was determined. From these results, it was concluded that two dominant and independent genes, *Av* and *Sv*, control susceptibility. In the presence of *Av*, another gene *Iv* causes hypersensitivity; it is not yet known whether *Sv* and *Iv* interact. Resistance results from the presence of both recessive genes *av* and *sv*. The genotypes of the four varieties studied are given as follows: Bagnolais, *Av Av sv sv iv iv*; Saxa o.F., *Av Av Sv Sv iv iv*; Top crop, *Av Av sv sv Iv Iv* and Great Northern UI15, *av av sv sv iv iv*.

4870 POLLARD, L. H.
Wasatch Bush—a new green-seeded lima bean.
Fm. Home Sci. 1958 : **19** : 4–5.

Wasatch Bush was developed at the Utah Agricultural Experiment Station by crossing Clark's Bush with Utah 16, a selection with white cotyledons, and by back crossing to Utah 16. It grows 12–15 in. high and is suitable for canning and freezing. The beans have a pale green testa and when processed are similar in colour to those of Clark's Bush or Early Thorogreen, both of which varieties have been outyielded by Wasatch Bush.

4871 WESTER, R. E., CORDNER, H. B. & MASSEY, P. H. (JUN.).
The Nemagreen bush Lima Bean.
Sth. Seedsman 1958 : **21** : No. 4 : 20–21.

A more detailed description is given of this recently developed variety [cf. XXVI, 3923]. It was produced from a cross between Oklahoma 27, a nematode-resistant, white-seeded type, and Early Thorogreen, back crossed to Early Thorogreen.

4872 CORREA, R. T. & STEPHENS, T. S.
Variety and strain evaluation of southern peas.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 90–95.

Data are provided on the yield and canning quality of 16 cowpea varieties. Extra Early Blackeye and Commercial Purple Hull were the best of the blackeye - purple hull group and Cream 52 Sp 16 was superior to other cream varieties.

4873 Suzuki, A.

(On breeding a dwarf cowpea).

Nihon Nogyo Kenkyusho Hokoku/Bull. Nippon agric. Res. Inst. 1957 : No. 8 : 53–58. [Japanese].

A dwarf strain, 62–14–6, with pods 16 cm. long containing 7–8 dark brown seeds of 1000-seed weight 139 g., has been bred from the combination (Manbu [Dwarf] x Azuki) x Fukushimazairai [Fukushima Common].

4874 Sapin, P.

Le soja à Yangambi. **(Soya bean at Yangambi).**

Bull. INÉAC 1958 : **7** : 105–15.

In surveying progress made in breeding and cultivating soya bean at the Agronomic Research Station of Yangambi, the characteristics of the best lines are presented in tabular form.

4875 Torrie, J. H.

Comparison of different generations of soybean crosses grown in bulk.

Agron. J. 1958 : **50** : 265–67.

The performances of successive generations of 11 soya bean crosses grown as unselected bulk populations were compared during 1950 and 1951 at Madison, Wis. A differential response for seed yield but not for other characters was found when the same generation was tested in different years; differences between crosses in respect of seed yield were however consistent when different generations were tested in the same year. Two and three-year old seed gave crops lower in yield and slightly later maturing than those obtained from one-year old seed. In both years, the performances of successive generations taken as averages over all the crosses were without significant differences in respect of plant height, days from emergence to maturity, lodging index, reaction to bacterial blight and quality characters.

4876 **Nematode resistance found.**

Agric. Res., Wash. 1958 : **6** : No. 8 : p. 15.

Four genotypes resistant to *Heterodora glycines* have been discovered in the world soya-bean collection of the US Department of Agriculture.

4877 Gheiking, Al. & Ille, C.

Contribuţii la studiul introducerii in cultura de noi soiuri de soia. **(Contributions to the study of introducing new soya-bean varieties into culture).**

Lucr. Inst. Cerc. aliment. 1958 : **2** : 363–74.

Trials of varieties introduced from Russia, the USA, China and elsewhere are reported, details being provided on yield, protein and oil contents and vegetative period. Herb 620 and Amur 41 are regarded as especially promising.

4878 Bryssine, P.

Travaux effectués sur le soja par le Service de la Recherche Agronomique. **(Work carried out on soya bean by the Agronomic Research Service).**

Terre maroc. 1955 : No. 31 : 1–3.

The results of recent varietal trials held in Morocco are reported; certain varieties have shown promise as forage crops. Some new short-day lines appeared to be suitable for autumn sowing and spring harvesting.

4879 Torrie, J. H.

A comparison of the pedigree and bulk methods of breeding soybeans.

Agron. J. 1958 : **50** : 198–200.

The crosses studied comprised Lincoln x Manchu 606, Lincoln x Flambeau, Z45–251 (selection of Mukden x Richland) x Manchu 606, Lincoln x Ottawa Mandarin, A45–251 x Flambeau and Mukden x Flambeau. F_6 lines developed by the pedigree and bulk methods did not differ with respect to the means for plant height, lodging resistance, reaction to bacterial blight, oil and protein content and iodine number of the oil. Within each cross, selection was carried out for early, intermediate and late maturity. Lines developed by the bulk method averaged 1 day later in both the intermediate and late groups and 4 days later in the early group than those developed by the pedigree method. The mean seed yields in the three maturity classes were similar in lines developed by the two methods, except in the intermediate and late classes in A45–251 x Flambeau, in which the bulk selections were superior.

4880 Bernard, R. L., Mumaw, C. R. & Browning, D. R.

Soybean varieties for Illinois.

Circ. Ill. agric. Exp. Sta. 1958 : No. 794 : Pp. 12.

The results of trials carried out on named varieties at several centres during 1951–57 in Illinois are summarized.

4881 Furutani, Y. & Sakata, K.

(The effect of day length and temperature on flowering and development of summer soya beans).

Nihon Sakumotsugaku Kai Kiji (Proc. Crop Sci. Soc. Japan) 1957 : **26** : 124–25. [Japanese].

The effect of 13 and 15 hr. photoperiods and temperatures of 18·4 and 21·2° C. on flowering period and number of nodes of the main stem were investigated for four early varieties from Kyushu and three early varieties from Hokkaido. The curtailment of flowering period due to short photoperiods was much more marked in the case of the Kyushu varieties. The Kyushu varieties responded to higher temperature by a shortening of the flowering period. A slight shortening of the flowering period also occurred in the Hokkaido varieties under 13-hr. photoperiods but a prolongation occurred under 15-hr. days. Long days usually caused an increase in node number, especially in the Kyushu varieties. Increased temperature brought about an increase in node number in the Hokkaido varieties but its effect was variable with the Kyushu forms.

4882 WANG, C.-L., WU, H.-L. & TSU, C. C.
(The effect of continuous selection following hybridization in soya beans).
Nung-yeh-hsueh Pao/Act. agric. sinica 1957 : **8** : 371–82. [Chinese].

Sixteen crosses were made during 1949–50 at the North-eastern Agricultural College; selection was carried out during the F_1–F_6 for maturation period, height, testa colour, yield and resistance to lodging and to *Pseudomonas glycinea*. The last two characteristics were the principal objectives of the breeding programme since the local standard variety is deficient in both these respects. Numerous high-yielding strains resistant to both lodging and bacterial blight were obtained.

4883 Forsøg med sorter af foderærter og kogeærter 1951–56. **(Trials of varieties of fodder peas and table peas, 1951–56).**
Tidsskr. Planteavl 1958 : **62** : 355–57.

Data on earliness and yield of seed and straw are presented for four fodder and four table pea varieties tested in Denmark together with cooking times for the latter.

4884 RIEPMA WZN., P. & VEENBAAS, A.
Resultaten van het doperwtenrassenonderzoek oogst 1955, 1956, 1957. **(Results of the varietal trial of shelling peas, 1955, 1956, 1957 harvests).**
Tech. Ber. Peulvrucht. 1957 : **74** : 1–50.

Data are given on the yield, straw stiffness, disease resistance and other agronomic characters, the proportion of peas of undesirable appearance and the canning quality of 30 varieties with round seeds and 36 with wrinkled seeds, tested in the Netherlands in 1955–57.

4885 REYNOLDS, J. D.
Trials of Dutch threshed pea varieties: 1949–1952.
J. nat. Inst. agric. Bot. 1957 : **8** : 82–95.

Data are given on the yields and field characters of the marrowfat peas Zelka and Emigrant and blue varieties Mansholt's GEK, Unica, Rondo, Stijfstro [Stiff Straw] and Servo, which have been studied in 41 trials in England. The results of texture tests on the canned processed peas are also reported. Servo gave consistently the highest yields. All the blue varieties frequently outyielded Zelka, which was usually surpassed in yield by Emigrant. The two last-mentioned varieties possessed the firmest texture.

4886 PESOLA, V. A.
On quality breeding of the field pea and its results at the Department of Plant Breeding, Agricultural Research Centre, Jokioinen.
Valt. Maatalousk. Julk. 1957 : No. 157 : Pp. 23.

Information is given on the protein content, seed colour, rate of softening of the dried peas when cooked, taste of the boiled peas, yield, number of days between sowing and ripening, and 1000-seed weight for varieties and hybrid selections developed at the above research centre, Finland, and for introduced varieties. Protein content, rate of softening and taste proved to be varietal features. Several of the lines bred at Jokioinen, producing white or green peas and representing a range in time of ripening, combine desirable cooking properties, taste and field characters. The best of these lines are expected to replace Paula, Kalle and Sinikka.

4887 LAMPRECHT, H.
Gekräuselte Blättchen bei *Pisum* und ihre Vererbung. **(Crinkled leaflets in *Pisum* and their inheritance).**
Agri hort. genet., Landskrona 1958 : **16** : 1–8.

Cases already known of crinkled leaflets occurring in peas are described. In the case of the *crispa* variant described by Wells [XXI, 2273], the author considers crinkling to be caused by a virus, for the leaflets were also variegated.

Assuming that susceptibility to the virus is controlled by a gene, it is suggested that the gene responsible be designated *Vac* (*variegato-crispus*). It is pointed out that the symbols *Crcr* proposed by Wells have already been used for a factor pair controlling flower colour. Further investigations are considered necessary to determine the exact position of the gene *Cr* (or *Vac*).

A new variant with undulate margins to the leaflets is described. This condition was found to be under the control of a single recessive gene designated *un*; the degree to which this gene is expressed is greatly influenced by the genotypic constitution. Information on the position of the gene *un* on chromosome IV was obtained from crosses involving *un Un* and 11 other gene pairs [cf. 4889].

4888 Lamprecht, H.
Zur Genbedingtheit des *obscuratum*-Merkmals von *Pisum.* **(On the genetic control of the *obscuratum* character in *Pisum*).**
Agri hort. genet., Landskrona 1958 : **16** : 49–53.

The *obscuratum* character [cf. XXVI, 3942] was found to be controlled by a recessive gene designated *obs*; the phenotypic expression of this gene is greatly influenced by the external environment and the constitution of the genotype.

4889 Lamprecht, H.
Weitere Koppelungsstudien im Chromosom IV von *Pisum.* **(Further linkage studies on chromosome IV of *Pisum*).**
Agri hort. genet., Landskrona 1958 : **16** : 9–37.

Recently published work on linkage and crossing over between the genes of chromosome IV is reviewed and the phenotypic expression of the 15 genes now known to occur on this chromosome is described. Factors which affect the expression of genes *tra* and *bt* are also mentioned. Further information on crossing over gained from ten new crosses made by the author is presented. A map showing the relative positions of the fifteen genes and the distances between them is given together with tabulated data on the frequency of crossing over between the genes. Genes separated by distances of 35–40% of the total chromosome length gave cross-over values of 42–55%; this may be explained by the frequency with which double cross-overs occurred.

4890 Lamprecht, H.
Die Koppelung des Gens *Obo* mit *R* im Chromosom VII von *Pisum,* sowie über Lamms genenleeres Chromosom und genenreiche Chromosomensegmente von *Pisum.* **(The linkage of the gene *Obo* with *R* in chromosome VII of *Pisum,* also on Lamm's geneless chromosome and gene-rich chromosome segments of *Pisum*).**
Agri hort. genet., Landskrona 1958 : **16** : 38–48.

After describing the effects of the interspecific recessive gene *obo* responsible for obovate leaves accompanied by complete sterility, the results are presented of observations on the segregation of *Obo obo* and twelve other gene pairs in three crosses. It is concluded that *Obo* is linked with the gene *R* on chromosome VII and it is thought that the most probable order for the seven known genes on this chromosome is as follows: $Wsp - Xa_1 - Pa - R - Tl - Obo - Bt$. By reference to his own earlier papers and those of other workers, the author explains why he disagrees with the following views of Lamm: (1) chromosomes V and VII are really one chromosome and thus a further chromosome with hitherto unknown genes may exist and (2) some of the chromosome segments with many genes are separated by regions containing hardly any genes. [Cf. XXVII, 2419 and XXVIII, 2386].

4891 Kul'čickaja, Z. A.
(Selection within the pea variety Ramon' 77).
Agrobiologija (Agrobiology) 1957 : No. 6 : 124–26. [Russian].

A form which has larger seed than the initial variety and yields 1·7 c. per ha. more was selected at Ramon'. It is being further improved by selection of plants with an increased number of seeds in the pod.

4892 Bolonkina, K.
(Field pea—a valuable protein plant for northern districts).
Nauk. pered. Opyt sel'sk. Hozjajstv. (Sci. progr. Exp. Agric.) 1958 : No. 3 : 42–43. [Russian].

Aleksandrovskaja 231, Falenki 42, and Spartanec [Spartan] are field peas which ripen early and produce higher and more regular yields of pods than late types such as Rozocvetkovyj [Pink-flowered].

4893 BLIXT, S.
Cytology of *Pisum*. I. Methodical investigation.
Agri hort. genet., Landskrona 1958 : **16** : 66–77.

A cytological technique is described which involves treating root tips with 5-7-dibromo-8-hydroxyquinoline followed by HCl before staining by the Feulgen method. This procedure enables chromosome measurements to be made with a fair degree of accuracy and facilitates identification of the chromosomes of *Pisum* and the recognition of structural changes in the caryotype. Factors which may affect reliability of the method are mentioned.

4894 LAMPRECHT, H.
Über die Chromosomenstruktur von *Pisum* mit einem neuen Fall von doppeltem Interchange. (**On the chromosome structure of *Pisum* with a new case of double interchange**).
Agri hort. genet., Landskrona 1958 : **16** : 54–65.

The normal type of chromosome structure for *P. arvense* is defined as that which is characteristic of the majority of cultivated forms occurring in the north temperate zone. Ways in which abnormal chromosome structure may arise are described; races with chromosome aberrations have occurred most frequently in high-lying regions such as Tibet and Abyssinia, where natural irradiation has more effect on the chromosomes than in lower regions.

All the known types of chromosome aberration in *Pisum* are described; these have resulted from single interchanges, double interchanges involving two or three chromosomes, single translocation and single and double duplications; in some cases the mode of origin of the aberration is unknown. The results of two new crosses indicate the existence of a new type of double interchange involving chromosomes I, IV and VII; on chromosome IV the break occurred between the genes *Tra* and *Con*. So far 15 different types of chromosome structure have been found in *P. arvense*.

4895 GELIN, O., EHRENBERG, L. & BLIXT, S.
Genetically conditioned influences on radiation sensitivity in peas.
Agri hort. genet., Landskrona 1958 : **16** : 78–102.

Seven pea varieties with different genotypes were involved in these preliminary studies. Seed samples of different water content were obtained by exposing the seeds to air of different humidities for one to two weeks; some of the samples were then treated with X rays and others with thermal neutrons. Half of each irradiated sample was allowed to germinate at a constant temperature of 10° C. and the other half at 25 to 30° C. As shown by the number of seedlings killed or with their growth inhibited, Weibull's 702, with the genotype *a Le R V*, was most resistant to X rays and Witham Wonder (*a le r V*) was the most susceptible. Low water content during irradiation and a low germination temperature accentuated the difference in the damage suffered by these two varieties. When irradiated seed was sown in the field, all the varieties, with the exception of Weibull's 702, had a similar percentage survival to maturity. Weibull's 702 had the greatest capacity to regenerate shoots from dormant tissue. Chromosome aberrations in root mitoses were also noted; at all the different water contents, Weibull's 702 had the lowest aberration frequencies and Witham Wonder appeared to be the most sensitive, at least at low water contents. Other varieties appeared to exhibit disturbance frequencies intermediate between those of Weibull's 702 and Witham Wonder. It is thought that chromosome aberrations may have caused the lethal effects observed. The genetic constitution did not influence the sensitivity of the seeds to fast thermal neutrons and it was concluded that the high sensitivity of the *r le* variety to X rays was not due to general physiological weakness.

4896 BUXTON, E. W.
A change of pathogenic race in *Fusarium oxysporum* f. *pisi* induced by root exudate from a resistant host.
Nature, Lond. 1958 : **181** : 1222–24.

Spore germination of race 1 is normally inhibited in the root exudate of the pea Wilt-Resistant Alaska, which is resistant to race 1. After its spores had been retained for 14 days in the root exudate of Wilt-Resistant Alaska, race 1 caused wilting of this host. Its virulence upon the susceptible pea Onward was however reduced. When reisolations and reinoculations were made on seven successive occasions, adapted race 1 retained its ability to wilt Wilt-Resistant Alaska. The possibility that the change in pathogenicity was due to a mutation induced by a substance in the root exudate is among the problems briefly discussed.

4897 QUANTZ, L.
Ein Beitrag zur Kenntnis der Erbsenvirosen in Deutschland. (**A contribution to knowledge of pea viruses in Germany**).
NachrBl. dtsch. PflSchDienst., Stuttgart 1958 : **10** : 65–70.

A virus causing stunting of peas has been isolated from a stunt and wilt disease complex affecting peas; it appears to be related to the Wisconsin pea stunt virus. The reaction of several susceptible varieties is described; from field observations on a collection of varieties, it was concluded that several varieties possess some resistance to the virus.

4898 Riepma Wzn, P.
De reactie van erwten op de zaaitijd. (**The response of peas to sowing time**).
Jaarboek 1957. (Yearbook, 1957). Med. Inst. biol. scheikund. Onderz. Landb-Gewass., Wageningen 1957 : No. 21 : 123–30.

Little difference in flowering time was found between the day-neutral peas Glorie de Quimper [Quimper Glory] and Kelvedon Wonder, on the one hand, and the three long-day varieties Celsior, Rondo and Lincoln, on the other, when sown in spring, but when sown in August, under day lengths similar to those of spring, the long-day varieties were considerably retarded in flowering. It is thought that the critical day length is probably increased at higher temperatures. All five varieties produced fewer basal branches, pods and seeds per pod and had a lower 1000-seed weight when sown later.

4899 Singh, D. & Sahai, J. M.
A new gram and a new arhar for U.P. farmers.
Indian Fmg. 1958 : **8** : No. **1** : 15–16.

Type 1 chickpea, derived from a cross between Banda and type 87, is an early variety flowering a week earlier than Banda and maturing in 145 to 150 days. It has bold, plump, brown seeds and the average yield is 18 maunds per acre rising to 30 maunds under favourable conditions. Type 1 has a spreading habit and is considered most suitable for the Bundelkhand area of Uttar Pradesh.

Type 105 is a tall spreading variety of *Cajanus cajan*; it is about ten days earlier than type 17. The brown seeds are medium sized and three to four seeds occur in a pod. The yield is 18 to 22 maunds per acre and when tested on Government Farms, Type 105 outyielded both Type 17 and local varieties; it is suited for central and western Uttar Pradesh and especially the Bundelkhand area. Wilt resistance and cooking quality are good.

4900 Bryssine, P.
La culture des pois-chiches au Maroc et ses possibilités d'amélioration. (**The cultivation of chickpeas in Morocco and its possibilities of improvement**).
Bull. Soc. Agric., Rabat 1955 : No. 67 : 31–41.

Most variation in chickpea has been found to be quantitative and recognition of different lines is difficult. At Rabat some natural hybrids were found and one of these has produced two lines which performed well in winter. Also mentioned are selections of large-seeded types which have shown promising hardiness and productivity.

4901 Luca, Y. de
Contributions à l'étude morphologique et biologique de *Bruchus lentis* Fröhl. Essais de lutte. (**Contributions to the morphological and biological study of *B. lentis* Fröhl. Tests on control**).
Ann. Inst. agric. Algér. 1956 : **10** : Pp. 94.

Varietal differences in susceptibility to *B. lentis* are recorded for lentils studied in Algeria; the early varieties suffered least.

4902 Menezes, O. B. de
Genética e melhoramento do guando (*Cajanus indicus* Spreng). [**Genetics and improvement of the pigeon pea (C. *indicus* Spreng.)**].
Bol. Inst. Ecol. Exp. agríc., Rio de Janeiro 1956 : No. 17 : Pp. 36.

[Cf. 1052].

4903 Kumar, L. S. S., Thombre, M. V. & d'Cruz, R.
Cytological studies of an intergeneric hybrid of *Cajanus cajan* (Linn.) Millsp. and *Atylosia lineata*, W. & A.
Proc. Indian Acad. Sci. : Sect. B. : 1958 : **47** : 252–62.

Details are presented of the chromosome morphology and microsporogenesis of *C. cajan*, *A. lineata* and an F_1 hybrid between these two species; in each case the chromosome number was found to be $2n = 22$. The parents were thought to be closely related on account of the similarity between their chromosome complements. However structural differences between chromosomes of the two species may have accounted for the partial abortion of seed and the low percentage of pollen germinating in the hybrid in which also some quadrivalents, bridges and fragments were seen during meiosis. *C. cajan* had been crossed with *A. lineata* in order to combine the wilt resistance of the latter with the desirable agronomic characters of the former.

4904 Divakaran, K. & Ramabhadran, G.
A marker gene for red gram (*Cajanus cajan*, Millsp.).
Curr. Sci. 1958 : **27** : 100–01.

A variant with "oblong obovate" leaflets is described. This character appears to be associated with vigour and may prove useful as a marker for improved strains.

4905 Williams, L. E. & Rolston, L. H.
The resistance of yellow sweet corn hybrids to Stewart's wilt disease.
Res. Circ. Ohio agric. Exp. Sta. 1958 : **49** : 3–14.

Tabulated information is provided on the resistance of 87 yellow sweet corn hybrids to *Bacterium stewartii*; in greenhouse tests, plants were inoculated with two different isolates and in the field, natural inoculations were carried out by flea beetles. The varieties least attacked by *B. stewartii* were Golden Beauty, Goldengainer, Golden Glory, NJ106 and Superchief. A few hybrids such as Tenderblonde were susceptible in the greenhouse tests but showed good resistance in the field.

4906 Walter, E. V. & Cowley, W. R.
Corn earworm resistance in sweet corn.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 75–78.

Sweet-corn breeding objectives for the Rio Grande Valley, Texas, are described and a brief account is given of available sources of genetic resistance to earworm (*Heliothis armigera*).

4907 Wene, G. P. & Otey, G. W.
Response of various sweet corn hybrids to individual ear treatments of DDT and oil formulations for earworm control.
J. Rio Grande Valley hort. Soc. 1956 : **10** : 79–89.

The hybrid Paymaster suffered less damage from the application of 1% DDT oil emulsion to control *Heliothis armigera* than the other five hybrids tested.

4908 Linnert, G.
Kerngesteuerte Gynodiözie bei *Salvia nemorosa*. **(Nuclear controlled gynodiecism in *S. nemorosa*).**
Z. VererbLehre 1958 : **89** : 36–51.

A dominant factor designated *F* was found responsible for the development of female plants. Such females usually gave equal numbers of female and hermaphrodite progeny, but in some cases, only females or more females than hermaphrodites were produced. It is thought that the recessive factor *f* controlling the hermaphrodite condition is coupled to lethal or sublethal genes.

4909 Ikeda, N. & Udo, S.
(Studies on mint breeding. VI. Studies on the utilization value of 4-ploid Japanese mint).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1956 : No. 54 : 51–66. [Japanese].

A comparative study of diploid and colchicine-induced tetraploid strains revealed that the tetraploids showed no overall improvement over their diploid progenitors in yield or essential-oil content but had a higher percentage of menthol in the oil [cf. XXVII, 3610].

4910 Chamura, S.
(On the analysis of selected seedlings obtained by selfing mint).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1955 : No. 53 : 155–68. [Japanese].

The earlier part of this paper is concerned with the technique of estimating menthol content. The later part provides information on the menthol content of seedlings of some Japanese varieties. Menthol content is believed to be polymerically determined, high content being dominant to low. Quantity of oil also appears to be determined by several genes and is correlated with foliage production. In the case of seedlings of the variety Sambi [Attractive in Three Ways], slight correlations were noted between menthol content and dark red pigmentation of the stem and between rust resistance and anthocyanin production.

ECONOMIC LOWER PLANTS

4911 Alihanjan, S. I. & Klepikova, F. S.
[Studying the effect of X rays upon variability in *Actinomyces subtropicus* (a producer of albomycin)].
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **115** : 806–08. [Russian].

X-ray induced mutants 444, 448 and 738 produce the antibiotic more actively than the initial strain 39 which was itself a mutant of 614K obtained by ultraviolet radiation. The experiments on induction of mutations by means of X rays showed that — variants by far exceeded + variants in frequency, but that sufficient of the latter occurred for selection.

4912 Böing, J.
Untersuchungen über *Streptomyces mirabilis* Ruschmann. I. Mitteilung: Die morphologische Variabilität. II. Mitteilung: Die antibiotische Aktivität der Varianten von *S. mirabilis*. (**Investigations on *S. mirabilis* Ruschmann. Part I. The morphological variability. Part II. The antibiotic activity of varieties of *S. mirabilis***).
Pharmazie 1958 : **13** : 229–36, 305–10.

The original culture of *S. mirabilis* studied had a large number of forms differing in morphology. Three of these remained constant when subcultured; these three and others originating from them are described in detail, mention being made of their growth and form on various nutrient media. Further studies showed that these variants differed in their effect on various gram positive and negative bacteria; the type of culture media also influenced the antibiotic action. It was concluded that the variants differ both qualitatively and quantitatively in respect of antibiotic production. Antibiotic activity of the variants was directly related to pigment formation; 59–1 which produced dark brown to black pigment was active against more species of bacteria than the other variants.

4913 Ohashi, M. & Yamanaka, H.
(**Experiments on selecting an improved strain for fermentation cultures suitable for manufacturing sweet rice-wine**).
Okayama Nogaku Shikenjo Rinji Hokoku/Spec. Bull. Okayama agric. exp. Sta. 1955 : No. 52 : 1–4. [Japanese].

The amylase activities of numerous strains of *Aspergillus flavus-oryzae* were determined and one strain especially suitable for preparing the above beverage was selected.

4914 Carilli, A.
Ceppi mutanti e tecniche relative in "*Penicillium chrysogenum* Thom." (**Mutant strains of *P. chrysogenum* Thom. and relevant techniques**).
Microbiol. esp. 1955 : **8** : 353–87.

A description is given of the growth rates of pigmentation and morphological mutants of the above species induced by ultraviolet irradiation at the Istituto Superiore di Sanità at Rome.

4915 Ganesan, A. T. & Swaminathan, M. S.
Staining the nucleus in yeasts.
Stain Tech. 1958 : 115–21.

The procedure described makes possible a selective staining of chromatin, and structures resembling chromosomes were seen when the stained cells were squashed. The young cells were first treated with 0·002 M 8-hydroxyquinoline which increased the viscosity of the cytoplasm; fixing was effected by OsO_4 followed by chloroform, and later treatments with NaCl and HCl removed ribonucleic acid and basophilic material. Giemsa stain was used.

4916 Oppenoorth, W. F. F. & Friends, F. H. M.
Kunstmatige bastaarden van gist door middel van DNZ. (**Artificial yeast hybrids by means of DNA**).
Vakbl. Biol. 1958 : **38** : 85–90.

After treatment with a DNA-containing extract of *Saccharomyces carlsbergensis*, which carries the dominant genes for fermentation of maltose, melibiose, raffinose and sucrose, a yeast normally recessive for these characters became able to ferment all four sugars. The transformed properties were retained through 20 successive passages through malt extract. Varying proportions of cells showed transformation. The few viable ascospores obtained from transformed single-cell cultures gave rise to colonies also able to ferment all the above sugars.

4917 Gauze, G. F., Kočetkova, G. V. & Vladimirova, G. B.
(**Biochemical mutants in yeast cells with disturbed oxidation**).
Dokl. Akad. Nauk SSSR (Proc. Acad. Sci. USSR) 1957 : **117** : 138–41. [Russian].

Mutants of *Saccharomyces cerevisiae* induced by trypaflavine, camphor or ultraviolet radiation showed a reduction in rate of oxidation and most of them an increase in the rate of aerobic glycolysis.

4918 Srb, A. M.
Recurrent changes in colony morphology dependent on intracolony selection of prototrophs occurring in red yeast.
Heredity 1958 : **12** : 257–70.

Bursts of white, prototrophic cells frequently occurred in colonies of red, adenine-requiring cultures of *Saccharomyces cerevisiae*, when a partial deficiency of adenine limited growth and the pH of the medium was 4·5. The phenomenon evidently depended on the strong selective advantage of spontaneous, adenine-independent back mutants under these particular conditions of culture.

4919 Kosikov, K. V.
(Directed hereditary variability in the fermenting properties of yeasts by means of a special substrate).
Ž. obšč. Biol. (J. gen. Biol.), Moskva 1957 : **18** : 476–96. [Russian].

New forms of *Saccharomyces globosus* which fermented (1) sucrose and raffinose, (2) maltose or (3) sucrose, raffinose and maltose and of *S. paradoxus* which fermented maltose or maltose and simple dextrins were obtained by culturing the initial yeast strains upon substrates containing the above substances. The acquired properties were transmitted to vegetatively and sexually reproduced generations. In the latter case segregation with regard to fermenting properties was observed in most forms though some forms of *S. paradoxus* which fermented maltose gave a progeny, all of which fermented maltose.

4920 Townsend, G. F.
Permanganate staining of yeast cells.
Trans. Amer. micr. Soc. 1957 : **76** : 316–17.

The technique described involves suspending washed yeast cells in an excess of 1–1½ per cent potassium permanganate solution for one minute before centrifuging and further washing; wet mounts were found most convenient for detailed examination of the cells. The cell is left with a light brown colouring and the boundaries of internal structures are well defined. On account of the clear outlines shown by the central vacuole and the cytoplasmic inclusion associated with the nuclear chromatinic material, it is thought that these entities both have separate membranes.

4921 Ganesan, A. T.
The nucleus of yeast cell—a study of five-day old fermenting cultures.
Cytologia, Tokyo 1956 : **21** : 124–34.

The nucleus of *Saccharomyces cerevisiae* 'BY–1' was studied in preparations made by using various fixatives and stains. The observations suggested that the bodies identified as chromosomes by Subramaniam and his colleagues may be artefacts of fixation or complex cytoplasmic inclusions. No differences were detected between the nuclei of aerobic and anaerobic cultures or between those of young and old cultures.

4922 Santa María, J.
Polyploidy in yeasts.
Nature, Lond. 1958 : **181** : p. 1740.

Eight further strains of *Saccharomyces cerevisiae* producing more than four spores per ascus have been found [cf. 3555]. Observations on the shape, size and germination of the spores suggested that the spores from multispored asci are haploid derivatives of polyploid asci. Formation of polyploid cells may be the result of mating between diploids or conjugation between mother cells and buds. The ability to form multispored asci is not lost with prolonged culture, although it may be diminished.

4923 Wright, R. E.
Extranuclear inheritance in yeast heterokaryons.
Diss. Abstr. 1957 : **17** : Publ. No. 24,341 : 2390–91. (Abst.).

A method is described which has been found satisfactory in confirming the cytoplasmic mode of inheritance of normal respiration and its suppression in petite colonies. The method involves the examination of bud clones from isolated heterocaryons for changes in respiratory behaviour not associated with recombination of nuclear markers.

4924 Ganesan, A. T., Holter, H. & Roberts, C.
Some observations on sporulation in *Saccharomyces.*
CR Lab. Carlsberg 1958 : **31** : 1–6.

Using the yeast Hybrid 307, which was known to produce 4-spored asci abundantly on Fowell's sodium acetate medium, it was found that for development into an ascus a diploid cell required to be in contact with this medium for at least 12 hr. at room temperature. Meiosis, once initiated, continued in spite of a sudden removal of the cell from the sporulation medium.

4925 Stehlé, H.
Morphologie et taxinomie des levures responsables de la fermentation des jus de canne et intervenant dans la fabrication du rhum. **(Morphology and taxonomy of the yeasts responsible for the fermentation of sugar-cane juice and taking part in the manufacture of rum).**
Rev. agric. sucr. rhum. Antilles franç. 1958 : **3** : 5–29.

After describing the characters, reactions to various ecological conditions and classification of yeasts in general, the taxonomy of yeasts involved in the fermentation of sugar-cane juice is explained, descriptions being provided of species and varieties of *Schizosaccharomyces*, *Zygosaccharomyces* and *Pichia*.

BOOK REVIEWS

4926 **Proceedings of the First International Photobiological Congress held in Amsterdam, August 23–28, 1954.**
H. Veenman & Zonen, Wageningen 1954 : 61s. : Pp. 472 : figs. : tables.

The First International Congress of Photobiology was held on 23–28 August 1954 in Amsterdam, under the auspices of the International Committee of Photobiology. Two hundred papers were given of which 121 are given in the present volume, mostly in full, but some in abstract form or in title only. The congress was divided into six sections, of which the Symposium on the effects of non-ionizing radiation on genetic elements of cells is of most interest to plant breeders and geneticists; this section comprises 35 papers and a final summary report by R. Latarjet.

In Effects of ultra-violet light on nucleic acid and nucleoproteins and other biological systems, J. A. V. Butler distinguishes between direct and indirect effects of UV radiation upon DNA. In the former, loss of viscosity and increased sensitivity to heat degradation occurs and this is interpreted as a breakage of H bonds in the Watson-Crick model, accompanied perhaps by minute amounts of deamination which would have a permanent effect and lead to genetical changes. Indirect effects include the dissociation of O_2 and H_2O_2, giving rise to OH radicals which can bring about breakage of the nucleotide chain and other degradative reactions including deamination and dehydroxylation of the bases.

T. Caspersson discussed the use of Ultraviolet microspectrography in the study of endonuclear structures and R. Latarjet spoke on Actions des radiations nonionisantes, peroxydes et peroxydases, sur les complexes bactéries-bactériophage (Actions of nonionizing radiations, peroxides and peroxidases on bacteria-bacteriophage complexes).

A. Kelner, speaking on The specific inhibition of DNA syntheses by ultraviolet light and its reversal by reactivating light, showed that UV irradiation at a dose killing 90% of the cells of a culture of *Escherichia coli* B/r resulted in two phases of reaction, the first a continuation of logarithmic growth but at a reduced rate and the second a sharp inhibition of growth, growth being measured as increase in cell mass. Synthesis of RNA paralleled cell growth but DNA synthesis was rapidly inhibited. The phase one reduction in growth rate was partially nullified by light, the restorative effect being proportional to the UV dose. Visible light had little effect on respiration or RNA synthesis but caused an immediate and rapid renewal of DNA synthesis. Phase two was almost completely eliminated by light. The speaker suggested that all mutagenic agents work by inducing inhibition of DNA synthesis.

In The use of action spectra for the evolution of some basic biological problems, A. Hollaender and M. R. Zelle reported independence between wave length and quantum yield in UV action spectra for efficiency of inactivation in two phages and found a higher quantum yield in phage T1 than in T2. Although *E. coli* 'SD–4' and '82/r' differ in mutagenic response to X rays, no difference between them was found in mutagenic or lethal response following monochromatic UV radiation.

J. G. Carlson gave an account of Effects of monochromatic ultraviolet radiation on the spindle and mitosis, in which he referred to a positive correlation between dosage and degree of spindle destruction and retardation of mitosis in the grasshopper *Chortophaga viridifasciata*.

Speaking on Some aspects of chromosome breakage in *Tradescantia* by ultraviolet radiation J. Kirby-Smith showed that, in treatment of dry pollen with equal doses, intensity of incident radiation may be varied by at least a factor of 10 with no change in aberration frequencies for one-hit breaks. No oxygen effect or photorecovery was observed. The action spectrum for chromosome breakage in the range 3650–2480 Å is in substantial agreement with that for bacterial inactivation.

C. P. Swanson spoke on The effects of combined infrared and X-ray radiations on cells. Irradiation of microspores of *Tradescantia paludosa* with infrared in the region of 9600 Å. prior or subsequent to X irradiation resulted in an increase in aberration frequency, although no pronounced absorption bands in this region could be detected. Infrared treatment was effective only below 20° C., the best temperature being 12° C.

R. W. Kaplan, in Unstable state of the gene during the mutation process induced by U.V. in *Serratia*, reported that UV irradiation of a red strain could induce unstable mosaic colonies the cells of which, without further division during storage on agar, could change spontaneously back to the parental red type or to a stable white type. This change was affected by the medium and was accelerated by both positive and negative heavy, weakly hydrated ions, suggesting that an amphoteric structure, such as protein, may be responsible for the unstable state.

H. B. Newcombe's work, reported in Ultraviolet mutagenesis and the nuclear division cycle in *Streptomyces*, showed that the photoreversibility of UV-induced mutagenic effects could be reduced when the irradiated spores were subsequently incubated in media allowing nuclear division to take place, and suggested that fixation of the effects occurred only when some critical stage in the nuclear division cycle had been reached.

In The nuclear role in the UV inactivation of *Neurospora* conidia, A. Norman suggested that inactivation of the conidia is the result of the inactivation of their nuclei.

K. C. Atwood's observations, in Ultraviolet effects on *Neurospora* heterocaryons, showing that inactivation of heterocaryons does not lead to their large-scale transformation into homocaryons unless conditions are immediately provided under which homocaryotic growth can be initiated before the damaged nucleus has time to recover, were in accordance with Norman's hypothesis of nuclear inactivation. Among substances found by K. Erdmann to exert a protective influence against UV-induced coagulation in protein solutions and inactivation in bacterial cells and yeasts are reducing substances such as sulphydryl compounds, ascorbic acid, $NaNO_2$, Na_2SO_3 and NaN_3. In some cases protection against X-ray effects was also afforded. This work is described in Contribution à l'étude des substances protégeant de l'action des rayons (Contribution to the study of substances giving protection against the action of rays).

W. Stein and W. Harm, in Modellvorstellungen zur UV-Inaktivierung von *Escherichia coli* (Model representations of UV inactivation of *E. coli*), describe a model representing genetic and nongenetic effects of irradiation and the various stages at which reactivation by light, heat or chemical agents may be supposed to take place.

Several studies of the action of peroxides were described. In Indirect effects of irradiation on bacteria, O. Weiss was concerned with the mutagenic action of the peroxides produced by UV-irradiated broth and peptone substrates. B. Miletic and C. C. Brinton, in Action of visible light and organic hydroperoxides on bacteriophages, reported that the inactivation effect of broth previously illuminated at 3500–5000 Å. upon phage was entirely counteracted by catalase added before or after illumination, suggesting that the lethal action is due to hydroperoxides. Synthetic hydroperoxides produced a similar lethal effect. T. Alper, in his contribution Possible modes of action of radiation produced peroxides, and of various radicals, on bacteriophage, reported that with ionizing radiation, most of the inactivation results from reaction with reducing radicals whereas with UV radiation at 2537 Å., no radicals are formed and inactivation occurs through direct action.

R. Thomas found similarities between phages and deoxyribonucleic acids in their curves of inactivation and denaturization at different temperatures and pH. These results are described in Activité biologique des acides désoxyribonucléiques et variations irréversibles de leur spectre ultraviolet (Biological activity of deoxyribonucleic acids and irreversible variations in their ultraviolet spectrum).

The three types of change considered by A. Kleczkowski in Intermediate stages of some viruses and enzymes in the course of their inactivation by ultraviolet (UV) radiation are: decreased solubility; decreased stability; and loss of ability to act normally in the absence of light.

G. Cavallo, in Sur la sensibilité d'un phage tempéré aux radiations non ionisantes. I. Photorestauration du phage UV-irradié (On the sensitivity of a temperate phage to nonionizing radiations. I. Photorestoration of UV-irradiated phage), reported that photorestoration occurred with illumination in a phosphate medium but not with illumination in broth.

M. Teti, in Photobiologie d'une bactérie lysogène non inductible (*E. coli* Lisbonne) [Photobiology of a noninducible lysogenic bacterium (*E. coli* Lisbon)], reported that the above strain resembles the nonlysogenous strain B in showing no reactivation by catalase after UV inactivation. In addition, it is not sensitive to hydroperoxides formed in organic media by illumination after UV radiation. After X irradiation, both catalase reactivation and hydroperoxide sensitivity are found to a slight degree.

On the basis of his Studies of the properties of ultraviolet irradiated *Escherichia coli* by means of reactivation, E. G. Cohn, who found that the curves both for killing and photoreactivation showed a multihit character, concludes that damage accumulates during UV irradiation and that photoreactivation consists in the elimination of these injuries one by one.

Other sections of interest to botanists are the Symposium on photoperiodism in plants and animals and the Biological section.

4927 BUTLER, J. A. V. & KATZ, B. (EDITORS). **Progress in biophysics and biophysical chemistry. Volume 8.**
Pergamon Press, London 1957 : £5 5s. : Pp. viii + 409 : figs. : tables.

Four papers in this volume are of genetic interest. The first of these, The electrochemistry of the bacterial surface, by A. M. James, is devoted to an exposition of the mathematical theory underlying electrocinetic phenomena, experimental methods for determining the electrophoretic mobility of biological particles and hence their ζ potential, and the biological significance of the results obtained. Electrocinetic characteristics are of genetic interest since heritable changes affecting them have been induced in *Aerobacter aerogenes* by growth in the presence of crystal violet or proflavine. The resulting populations are homogeneous and their mobility value is not correlated with the degree of training. It is concluded that the change is induced by the treatment and is not a consequence of natural selection of preexisting forms.

In the second paper, Effect of radiation on DNA synthesis in mammalian cells, L. S. Kelly assembles evidence suggesting that DNA synthesis is relatively insensitive to irradiation. The third paper, The physical chemistry of deoxyribosenucleic acid, by K. V. Shooter, treats the DNA molecule from the strictly physical chemical angle but the review of the evidence that "DNA exists in solution as a heterogeneous system of bent or coiled molecules" has obvious biological implications.

The fourth paper, The biosynthesis of proteins, is a particularly useful survey. Among the aspects considered are the danger of drawing incorrect inferences from experimental artifacts in protein synthesis; the evidence, largely derived from studies of incorporation of isotope-labelled aminoacids in animal tissues, for concluding that protein synthesis is associated with RNA particles; and the necessity for the presence of adenosine triphosphate, either guanosine triphosphate or guanosine diphosphate, and an enzyme complex precipitating at pH 5 for aminoacid incorporation. In a final section a trinucleotide code for information transfer from RNA to protein, suggested by Crick, Griffith and Orgel, is discussed.

The other papers deal with the physiology of hearing, colour vision, the axon surface, connective tissue and erythrocyte permeability.

4928 **The biological replication of macromolecules. Twelfth Symposium of the Society for Experimental Biology.**
Cambridge University Press 1958 : 50s. : Pp. vi + 255 : figs. : tables : plates.

The twelfth symposium maintains the high standard established in previous issues [cf. XXVII, p. 758].

In Self-reproduction and all that, G. Pontecorvo examines evidence leading him to conclude that the ultimate unit of mutation and recombination may be a single nucleotide pair, from which it is further concluded that the definition of self reproduction requires that "a collection of building blocks (say, of the four main types of nucleotide), which could arrange themselves into any one of all the possible sequences, becomes arranged into only one sequence *because of the pre-existence of such a unique sequence*".

In Fractionation of deoxyribonucleic acids and reproduction of T2 bacteriophage, G. L. and A. V. Brown point out the mixed nature of the usual preparations of deoxyribonucleic acids and describe a method whereby a unique deoxyribonucleic acid species was isolated from T2 bacteriophage and shown to carry genetic determinants controlling the structure of the tail protein responsible for the host-range properties.

A. Bendich, H. B. Pahl, H. S. Rosenkranz and M. Rosoff, in Studies of deoxyribonucleic acids with the aid of anion exchangers, also refer to the complex nature of the polynucleotides that comprise most isolates of DNA and describe a chromatographic method of fractionation using the anion exchanger ECTEOLA. Some of the problems that might possibly be solved by such an approach are outlined, on the basis that nucleic acid is the least common denominator for all members of the evolutionary scale of living organisms.

In Size limitations governing the incorporation of genetic material in the bacterial transformations and other non-reciprocal recombinations, R. D. Hotchkiss considers the mechanism whereby bacteria undergoing transformation may alter the incoming DNA in various ways having both qualitative and quantitative effects.

Transformation experiments with a pneumococcal mutant resistant to sulphonamide indicated the system to be at least tripartite and transformants more often than not acquired only one or two parts and rarely the whole system, which suggests that only a fragment of the entering DNA is usually utilized in producing genetic changes. Recombination would appear to be restricted by size and probably also by directional polarity in the DNA strands.

P. Schaeffer, in Interspecific reactions in bacterial transformation, suggested an explanation for the lower frequency of interspecific transformations by strains of *Haemophilus* spp. resistant to streptomycin, as compared with the frequency within species, based on the assumption of imperfect pairing between the DNA of the two species; the penetration mechanism, on the other hand, does not seem to be species-specific. In the discussion it was pointed out that lower viability resulting from the presence of foreign genetic material would explain the results without assuming reduced frequencies of interspecific transformation.

F. Jacob and E. L. Wollman, in Genetic and physical determinations of chromosomal segments in *Escherichia coli*, give reasons for supposing that all the known genetic characters of *E. coli* K–12 are linked, but are not arranged along a straight line; a circular scheme for representing them is presented. Exposure of *Hfr* donors to ultraviolet rays before mating impairs integration of the characters located on the transferred segment. The number of genetic exchanges occurring between two given characters is increased by irradiation. This suggests that recombination in bacteria does not occur by breakage and reunion but rather by some "copying choice" mechanism. Radiophosphorus disintegration interferes with both the transfer and integration of genetic material. The order of markers determined by this method of study corresponds well with that established by purely genetic methods.

In Fertility factors in *Escherichia coli*, H. L. Bernstein reviews the knowledge on partial fertilization such as transduction of small amounts of genetic information by phage particles, or cell-to-cell transfer of colicinogenesis; on sexual recombination; and on mating types. A number of new mating types have been found, some of which are described, together with the results of some studies on their inheritance. Recombination between mating types shows that more than one locus is involved. Certain strains are able to transmit fertility to other strains by cell-to-cell contact and the determinants show no linkage with other genes in the cell. Analogies between this situation and phage and colicinogenesis are pointed out.

Colicins and colicinogenic factors were dealt with by P. Fredericq, who described the nature of the colicins, which make some strains of *E. coli* antagonistic to other strains or species, the methods of detecting them and their main properties. Mutants resistant to one colicin may mutate again and become resistant to a second. Occasionally resistant mutants have shown resistance also to a particular bacteriophage, in which case the phage and colicin seem to share the same receptor. A number of linkages are reported and recombination experiments show that resistances to the same colicin may reside at different loci. The nature of the colicins is compared to that of the lethal protein in the phage tail. Transformed bacteria which have become colicinogenic by contact with a colicinogenic strain retain all their other properties unchanged. The transfer seems to require conjugation of the cells, but is independent of the other genetic characters of the cell.

In Replication of an animal virus, F. K. Sanders, J. Huppert and J. M. Hoskins describe an animal virus-host system that approaches the bacteriophage-bacterium system in ease of investigation: it comprises the encephalomyocarditis virus (EMC), which seems to contain only RNA, on Krebs 2 ascites cells. It has not been firmly established whether the pathogenic effect is produced by the RNA or by minute amounts of protein that enter with it. Three strains of the virus have been isolated. F. H. C. Crick spoke On protein synthesis, emphasizing the biological role of the protein molecule, which he described as "a unique instrument in which an underlying simplicity is used to express great subtlety and versatility". Only about twenty different kinds of aminoacids occur in proteins but these are present in almost all proteins and almost all of them have the L configuration; they are moreover present in the same order in the peptide chain in any given protein and the folding of the chain, with the bonding that results, also seems to be characteristic. A single change in sequence is apparently responsible for the lethal nature of the sickle-cell-anaemia haemoglobin; hence this "sequentialization" (*must* scientists invent such words?) is seen as the crucial problem of protein synthesis. The important role of microsomal particles, which are rich in RNA, in protein synthesis is demonstrated; the first step seems to be the activation of each aminoacid by a specific enzyme and ATP; it is suggested that some of the RNA in the microsomal particle acts as a template, the protein component merely supporting and protecting it; different particles are supposed to have different base-sequences in their RNA and thus produce different proteins; this template RNA is supposed to be synthesized in the nucleus under the direction of DNA, further RNA being synthesized in the microsomal particle, its sequence determined by base-pairing with the template RNA. Finally, reference is made to a code devised by the author and collaborators from which just twenty aminoacids would be expected.

In Protein synthesis as part of the problem of biological replication, J. L. Simkin and T. S. Work review recent results which suggest that protein synthesis proceeds by a series of discrete steps, each of which can be studied in cell-free systems; these investigations too point to the role of RNA in the microsomal particles and the conflicting nature of some of the evidence may again point to the existence of two forms of DNA. Difficulties in applying some of the speculative mechanisms to the whole of the experimental evidence are pointed out. F. B. Straub spoke on Formation of amylase in the pancreas, presenting evidence suggesting the existence of intermediary stages in enzyme formation.

M. Stacey, in The biosynthesis of oligo- and polysaccharides, reviewed some of the recent experimental results, one of them being a claim to have synthesized bacterial cellulose. It now seems that the glycosides form specific substrates for a wide variety of enzyme systems, the enzymes having been identified as proteins. By the use of appropriate enzymes, branched polysaccharides have been synthesized and information obtained as to the mechanism of branching.

Possible mechanisms by which information is conveyed to the cell in enzyme induction were discussed by M. R. Pollock and J. Mandelstam. It is submitted that the induction of enzymes in microorganisms does not result in the formation of a new species of molecule, as in antibody formation, but merely accelerates the production of a protein which the cells are already, by their genetic constitution, capable of producing. In discussing Processes co-ordinating intracellular activity, A. Marshak introduced a refreshing note of realism by emphasizing the state of our ignorance as to the products and reactions which intervene between the gene and the enzyme; evidence is adduced pointing to the degradation of DNA to units of small molecular size before nuclear fusion, to the role of nuclear RNA as a precursor of cytoplasmic RNA and even of DNA, and to the operation of three substances, RNA, DNA and histone, in gene and chromosome replication. The speaker expressed the opinion that in both biochemistry and genetics new avenues of approach to long-standing problems are needed and put forward a hypothesis according to which the chromosome fibril acts as a semiconductor, so that short regions of it may act as electromagnetic oscillators each with a characteristic period determined by the properties of the particular coupled RNA, DNA and protein of that region. These units may in turn be coupled into an oscillating circuit encompassing the whole chromosome or chromosome complement; the source of power may be derived from nucleotide turnover, which might produce a form of pulsation. On this basis the helical shape of the chromosome subunits and of DNA and proteins comes to have a physical significance in the cell economy as well as a purely metabolic one and certain features of cytoplasmic structure, such as the vesicular character of the endoplasmic reticulum, the mitochondrion chambers and cristae and the pores of the nuclear membrane, may take on a new meaning.

N. A. Mitchison spoke on Tissue transplantation and cellular heredity, referring to support given by both genetical and immunological research to the hypothesis of one gene-one antigen. The information on the mechanism of immunological change in tumour cells is at present conflicting but few if any cases of genetic recombination between the cells of tumour and host have been detected.

In L'action inhibitrice du glyoxal sur les macromolécules biologiques, J. A. Thomas reviews recent research on the toxicity of glyoxal or its derivatives to various types of virus and bacteria and on its capacity to cause chromosomal aberrations in animal tissues and in the roots of *Allium sativum* and *Pisum sativum*. The results suggest that the glyoxal modifies the proteins associated with DNA.

4929 Rieger, R. & Michaelis, A.
Genetisches und cytogenetisches Wörterbuch. **(Genetical and cytogenetical dictionary).**
Springer-Verlag, Berlin 1958 : 2nd Ed. : DM49.60 : Pp. 648 : 149 figs. : tables.

A technical dictionary is always welcome to progressive research workers and students who wish to keep abreast of the literature of their subject in their own and other languages. This cytogenetical dictionary will be useful to German-speaking readers for the former purpose and to biologists of all other nations for the latter. It is a revised and enlarged version of a glossary previously published as a supplement to *Der Züchter* and provides definitions, in German, of some 4000 terms, largely representing those employed in the sciences specified in the title, but embracing also a certain number from cognate sciences such as evolution and plant physiology. A useful feature is the frequent indication of the author responsible for coining the word, the date of its first being used, and not infrequently the English equivalent. Some of the definitions are accompanied by explanatory diagrams or tables and occasionally extend to brief essays, reference being also made to definitions of other terms used in the explanation. Even still, the fact that terms beginning with the letter A extend over 56 pages, and the whole alphabet covers 596, can only make one shudder at the readiness of biologists to invent new words (rather than explain old phenomena?), while marvelling at the industry of the authors who have collected them together and gone a great way to making many of them comprehensible.

There is also a bibliography, covering some 1500 references, distinguished by a high degree of accuracy in citations of German and English titles, though there are some errors and some authors, for instance Hiesey and Hadorn, are misspelt; the accuracy is somewhat less in respect of titles in French and Italian.

4930 Sparrow, A. H., Binnington, J. P. & Pond, V.
Bibliography on the effects of ionizing radiations on plants, 1896–1955.
Brookhaven National Laboratory, New York 1958 : $2.25 : Pp. v + 222.

As explained in the introduction, compilation of this bibliography was initiated by the senior author for his personal use, and after several hundred references had been assembled with no end in sight it was decided to make a fairly exhaustive literature search with the aim of eventual publication. The bibliography lists literature dealing with cytological, genetical, morphological, physiological and all other kinds of effects of ionizing radiations. Taxonomically the coverage extends from the lower forms as represented by the fungi, algae and bryophytes to the gymnosperms and angiosperms. Bacteria are not included. A list of conferences, congresses and symposia and a key to abbreviations of periodicals are followed by a list of 2586 references and an outstandingly good subject index. The publication should be of considerable value not only to newcomers in the field but also to established investigators.

4931 Darwin, C. & Wallace, A. R.
Evolution by natural selection.
Cambridge University Press 1958 : 25s. : Pp. viii + 288.

On the occasion of the centenary of their publication, on 2 August 1858, the Darwin-Wallace papers, the eighteen pages of which are described by Sir Gavin de Beer in his preface as "among the most pregnant ever written", have been reproduced in this memorial volume, together with Darwin's sketch of 1842 and essay of 1844. The latter is described as in some ways to be preferred to the *Origin of species*, since it embodies Darwin's reasons for his conclusions whereas the *Origin* gave only the evidence.

In his Preface, Sir Gavin mentions some of the pieces of knowledge, today taken largely for granted, that were absent when Darwin wrote his work, and examines the impact of the science of cytogenetics on the development of evolutionary thought. The introduction which Sir Francis Darwin wrote to the sketch of 1842 and the essay of 1844 when they were published in 1909 is also reproduced.

4932 Sheppard, P. M.
Natural selection and heredity.
Hutchinson & Co., Ltd., London 1958 : 18s. : Pp. 212 : 8 figs. : tables.

With the centenary of the publication of the Darwin-Wallace papers we can expect a series of books on the subject of evolution and the present volume is one of the first. It is a defence of the principle of natural selection, which not only accounts for the facts of adaptation and evolution but is, we are told, the only hypothesis that will explain them adequately. A number of concrete examples of the way in which selection can operate are given throughout the book, most of them being taken from the insects but a few from other groups of the animal, and occasionally the vegetable, kingdom. Thus the operation of selection in natural conditions is illustrated by the case of industrial melanism in moths, by experiments with *Drosophila* spp., *Paratettix* spp. and land snails and by the blood groups in human beings. There is much discussion of the mechanisms by which polymorphism may be maintained in natural populations, the viewpoint presented being that polymorphism can only exist if the genes concerned have some selective value, however slight. Where such selective values have not been detected it is for want of looking, we are told, and no proof that they do not exist. In illustration of this principle the blood groups in man are again cited.

The reader is next introduced to the principles of polygenic inheritance, it being shown how the pressure of natural selection can result in the accumulation of balanced groups of linked polygenes, which can be broken down again also by prolonged selection, as postulated by Mather. It is further shown how selection may in certain circumstances lead to phenotypic flexibility. The role of mutation in increasing variation is explained but genetic drift is considered to be of much less importance than was once supposed in altering the composition of populations.

Four alternative hypotheses for the origin of dominance are examined, all of which may, it is suggested, have operated in certain cases. The chapter on protective coloration demonstrates how even slight differences in the power of an organism to adjust its colour or other features to harmonize with its surroundings may have survival value. In the chapter on mimicry, experiments are quoted in which the author obtained no clear-cut segregation ratios in crosses involving mimicking forms and their relatives, suggesting that they are conditioned by modifiers rather than multiple alleles. Goldschmidt's views on the different nature of specific and subspecific distinctions come under fire in the chapter on species.

In a section devoted to ecological genetics plant ecologists are criticized for having neglected density-dependent factors and a suggestion is made as to a possible cause of the greater hardiness of certain polyploid forms: they have been able to evolve in unfavourable areas without gene flow from other areas, to which the diploids have been perpetually subject. Indeed, the separation of populations into noninterbreeding groups is given as one of the prerequisites for speciation, in animals if not in plants, and the sudden appearance of a markedly distinct species, even by polyploidy, is regarded as "very unlikely".

4933 Brachet, J.
Biochemical cytology.
Academic Press, Inc., New York 1957 : $8.80 : Pp. xi + 516 : 190 figs.

The subtitle of this volume could well be "The role of the nucleic acids in the cell"; for this is the main theme of the book. The first introductory chapter outlines the development of the study of DNA and RNA since the 1930's. Chapter II briefly surveys the techniques available for studying them. Chapter III is the most general in approach, since it is concerned with the cytoplasm of the resting cell and only the section on microsomes deals in any detail with RNA. In the fourth chapter on The nucleus of the resting cell, the fifth on Mitosis and the sixth on Nucleic acids in heredity and protein synthesis, the emphasis falls inevitably on the nucleic acids and the importance of these compounds is also stressed in Chapter VII on Nucleocytoplasmic interactions in unicellular organisms and in Chapter VIII on The nucleus and the cytoplasm in embryonic differentiation. Remarks on cancer cells also have a bias towards the part played by the nucleic acid and the possibility of therapy by chemical inhibition of DNA or through the use of ribonuclease. The final chapter is the only one in which RNA is mentioned only once and DNA not at all. This unifying theme draws the book into a satisfying, well-knit whole. The nucleic acids are of such importance in genetics, protein synthesis and cell differentiation, that by concentrating on them, Professor Brachet is able to connect up cell structure, cell division and morphogenesis with cell metabolism and biochemistry, topics which all too often remain isolated and unintegrated.

That the book is also stimulating is partly due to the author's style. Written directly in English, it retains a certain French liveliness. The claim of Manna, for example, that chromosome numbers in human endometrium may vary between 27 and 68 is regarded as unsurprising since, on the authority of François I of France, "Souvent femme varie, Bien fol est qui s'y fie". The stimulating qualities of this work do not depend entirely on its readability, however. They also arise from the author's intense interest in current problems. He is not content merely to describe ascertained facts, which he does clearly and well, but also eagerly discusses hypotheses, both his own and those of other workers, and possible methods of putting them to the test. But although interested in hypothesizing, he has no bent for philosophizing: his final chapter, in which he discusses the meaning of "life", is only two and a half pages long, the shortest in the book, and he confesses that he is always irritated by being asked whether an isolated nucleus or chromosome is living. This chapter seems to have been included more for the sake of convention than for any other purpose.

Professor Brachet's own interest lies in animals rather than plants, but he devotes considerable attention to bacteria, fungi, phages, viruses and green plants and since he is concerned with fundamental aspects of cell biology, his book will be of value to both animal and plant cytologists. The attractiveness of the book is enhanced by the numerous fine photographs and its usefulness by a detailed index and full bibliographies.

4934 BOURNE, G. H. & DANIELLI, J. F. (Editors).
International review of cytology. Volume VII.
Academic Press Inc., New York 1958 : $16.00 : Pp. 684 : figs. : tables.

This year's issue contains thirteen contributions. As in the volume of the previous year, most of the reviews deal exclusively with topics concerning animal organisms [cf. XXVII, 1076]. Cytologists and geneticists working with plants will however find one paper of especial interest. In Recent advances in the study of the kinetochore, A. Lima-de-Faria gives a useful survey in which he brings together the results of his own research on the structure and function of this region in the chromosomes of plants, particularly in *Tradescantia*, *Trillium*, *Allium* and *Hyacinthus*, discusses his findings in relation to those of other investigators and reports some additional data. The paper is illustrated by excellent drawings and photomicrographs. The view is expressed that the centromere now emerges as the segment which is best known structurally and which presents fewer difficulties of study than other differentiated regions of the chromosome. This situation is ascribed to the highly successful utilization of the squash technique, experience gained in applying this technique, choice of material and photomicrographing being outlined. In mitosis, the centromere has usually been found to be already divided at midprophase. At metaphase I, the centromere has been observed to be functionally single and to divide during preparation for anaphase I, this division taking place parallel to the main axis of the spindle. At metaphase II, the sister chromatids are regarded as being held together by the proximal region of the arms, passage into anaphase II being independent of the division of the centromere. Differences and similarities in the organization of the centromere during mitosis and meiosis have recently been further elucidated. Centromere structure in mitosis and meiosis I and II is fundamentally similar as regards the folding observed during preparation for anaphase and in the orientation of the folding to opposite spindle poles shown by the two independent centromeres of sister chromatids in mitosis or the two chromosomes of a bivalent in meiosis. The folding is however slight at mitosis but very marked at metaphase I. The position of the centromere relative to the proximal region of the arms at metaphase I also differs according to type of cell division. At this stage in meiosis I, the proximal regions of the arms lie in two different axes which are parallel or almost parallel, whereas at metaphase of mitosis or meiosis II they lie in the same axis. Another characteristic feature of meiosis I is the very considerable length of the centromere relative to the arms. The author goes on to discuss the region with respect to the evidence concerning its delimitation, chromomere structure, possession of DNA and genes, and the functional significance of its division. Some recent observations on the centromere of *Tradescantia virgiana in vivo* are incorporated and shown to correspond with those on fixed material. Further consideration is given to the functional aspect in a section dealing with centromere organization in relation to chromosome movement. Reasons are given for disagreement with the "mechanical" interpretations of chromosome movement adopted by Darlington and Östergren. The writer finds himself most in accord with Belar, who attributed the primary cause of chromosome movement to chemical activity of the centromere. In this connexion, the significance of the increase in the surface of the region by folding and the increase in the surface available for contact with the spindle consequent upon the orientation of the folding parallel to this body is emphasized. Östergren and his coworkers [XXIV, 1606 and XXV, 2568] have reported that in mitosis in the higher plants the cytoplasm surrounding the spindle poles may show an aster of the same type as that observed in animals. The author now reports that he has noted a similar aster at anaphase I in an apomictic strain of *Poa alpina* and suggests that in higher plants the centromeres may contribute to the development of the aster. Finally, the role of the centromere in chromosome organization is considered, along the lines of the author's hypothesis of gradients, some additional data on rye and *Trillium* being included.

One other paper may be mentioned for its general interest: Some biological aspects of experimental radiobiology: a historical review, by F. G. Spears. Mainly concerned with man and animals but with some reference to higher and lower plants, this contribution offers a survey of the various biological effects, including cytological and genetical changes, brought about by exposure to radiations, the main theories dealing with the mode of action of these agents, and problems of dosimetry and protection.

4935 DANIELLI, J. F. (Editor).
General cytochemical methods. Volume 1.
Academic Press Inc., New York 1958 : $12.80 : Pp. xi + 471 : figs. : tables.

This is the first of a review series which will appear at intervals of about two years. Subsequent issues will each contain a number of descriptions of additional techniques and supplements so that the information to be found in the earlier volumes will be kept up to date. As the editor explains in his preface: "the endeavor is to include techniques which have been sufficiently studied to eliminate most of the uncertain points which in cytochemistry usually beset a new method". This welcome addition to the invaluable review publications of the Academic Press is inaugurated by nine contributions, of which the following are likely to offer most to cytologists engaged in plant research: The weighing of cellular structures by ultrasoft X-rays, A. Engström and B. Lindström; The determination of mass and concentration by microscope interferometry, H. G. Davies; Ultraviolet microspectrophotometry, P. M. B. Walker; Quantitative determination of DNA in cells by Feulgen microspectrophotometry, C. Leuchtenberger; and Autoradiography as a cytochemical method, with special reference to C^{14} and S^{35}, S. R. Pelc. The remaining papers are: The cytochemical demonstration and measurement of sulfhydryl groups by azo-aryl mercaptide coupling, with special reference to mercury orange, H. S. Bennett and R. M. Watts; Indigogenic staining methods for esterases, S. J. Holt; Fluorescent antibody methods, A. H. Coons; and The calcium phosphate precipitation method for alkaline phosphatase, J. F. Danielli. The contributors deal not only very competently with details of equipment and procedures but also explain the theory of the various techniques and give critiques of the methods and assessments of results obtained by their application in investigating both animal and plant cells. The first volume lays an excellent foundation for the fulfilment of the main purpose of the series.

4936 TWENEY, C. F. & HUGHES, L. E. C. (Editors).
Chambers's technical dictionary.
W. & R. Chambers, Ltd., Edinburgh & London 1958 : Revised Ed. with Suppl. : 35s. : Pp. vi + 1028 : figs. : tables.

Everyone who has used the earlier editions of this useful dictionary [cf. XI, p. 62 and XVIII, p. 392] will welcome the latest revised edition. Those unacquainted with the work may wish for information on its scope, which embraces the chief terms employed in over a hundred branches of scientific and industrial activity, including pure and applied biology. The third edition contains altogether 55,000 entries. The definitions and choice of terms given in the main part remain unchanged, new terms covering the latest advances in science and technology being explained in an enlarged supplement of 74 pages with nearly 5000 items. Common genetical and evolutionary terms are on the whole satisfactorily defined according to the nonspecialist aim of the dictionary, although—a small point—*gene string* strikes one as an obsolete inclusion.

4937 KARRER, W.
Konstitution und Vorkommen der organischen Pflanzenstoffe (exclusive Alkaloide). [**Constitution and occurrence of organic plant materials (excluding alkaloids)**].
Birkhäuser Verlag, Basel 1958 : sFr. 136 : Pp. 1207.

This is a reference book in the true sense. For each of the compounds included, information is given on names and synonyms, composition, structural formula, form in which it occurs, melting or boiling point, and references are given to the main literature concerning its synthesis, distribution and properties. The compounds are arranged in sections, the first being carbohydrates, the second alcohols, phenols and naphthols, the third stilbenes and so on. Only compounds whose constitution is known are included.

There is an index of plant names, with indications in some cases of the main compounds produced by the species in question, and an index of the names of the substances. The volume is produced with the high standard we have come to associate with this publishing house. The literature up to the end of 1956 has been included in its compilation.

4938 Flore du Congo Belge et du Ruanda-Urandi. Spermatophytes. (**Flora of the Belgian Congo and Ruanda-Urandi. Spermatophytes**). Institut National pour l'Étude Agronomique du Congo Belge, Bruxelles 1958 : **7** : Pp. 367 : 1 map : 11 figs. : 36 plates.

Volume VI of this flora was issued in 1954 [cf. XXV, p. 634]. The contributors to the present volume are R. Boutique, G. Gilbert, L. Hauman, J. Léonard, E. Petit, A. Robyns, W. Robyns, P. Staner, G. Troupin and R. Wilczek, the families covered comprising the Pandaceae, Oxalidaceae, Geraniaceae, Linaceae, Erythroxylaceae, Lepidobotryaceae, Zygophyllaceae, Balanitaceae, Rutaceae, Irvingiaceae, Simaroubaceae, Burseraceae, Meliaceae, Malpighiaceae, Vochysiaceae, Polygalaceae, Dichapetalaceae and Callitrichaceae.

4939 MALI, L.
Maatalouden sanakirja. (**Agricultural dictionary**).
Kustannusosakeyhtiö Otava, Helsinki 1958 : Pp. xxviii + 595 + 177.

The problems which confront the compiler of a multilingual technical dictionary are manifold and the labour enormous. As stated in the foreword to this book, the scope of the concepts being considered must be "surveyed, defined, and if necessary made more accurate"; they must be "studied within the sphere of each separate language concerned, and comparatively between one language and another".

In this dictionary, based on the alphabetical order of the Finnish terms, the equivalents of some 50,000 Finnish technical expressions relating to agriculture are given in Swedish, German and English. Differences between British and American usage are indicated where they exist. The scope of the dictionary is agriculture in a wide sense, including many affiliated sciences. Symbols are used to denote the special technical fields; a key to these is given at the beginning of the book and also, for convenience of reference, on a loose card. Following the main dictionary are indexes in Swedish, German and English for cross reference, which is simplified by numbering the entries on each page of the main dictionary. Lastly comes an index of Latin scientific terms and names of organisms. Only one slight inaccuracy was noted in a random survey of the plant-name equivalents. The Finnish word *salkopapu* (*Phaseolus vulgaris*) has the English equivalent *runner bean*, in the USA, *pole bean*. But the term *runner bean* in England usually denotes *Ph. coccineus* and is used interchangeably with *scarlet runner* which is correctly given as the equivalent of the Finnish *ruusupapu*. The difficulties of establishing exact correspondences between agricultural terms in different languages are so great that the author is to be congratulated on the very high degree of accuracy that she has achieved both as regards the equivalents worked out and the cross referencing. The dictionary will be indispensable to all research workers concerned with Finnish agriculture.

4940 RANDHAWA, M. S.
Agricultural research in India. Institutes and organisations.
Indian Council of Agricultural Research, New Delhi 1958 : 40s. : Pp. v + 448 : 79 plates : tables.

Information concerning the scope and function of research institutions in India and the results of the very considerable number of projects has hitherto been scattered in the reports and other publications of the Indian Council of Agricultural Research (ICAR) and of the commodity committees for particular crops. This information has now been arranged conveniently in an attractively produced guide to all research in connexion with crop production and utilization, forestry, animal husbandry and fisheries. M. S. Randhawa, vice-president of the council, contributes an introduction, giving an historical outline of the organizational development of agricultural research in India. An account of the work of the council comes next, the schemes in crop breeding and many other fields of improvement financed by this body being indicated in a table occupying no less than 66 pages. The Statistical Wing of the ICAR is dealt with in a separate section. Information is then provided on the central institutes, central commodity committees, and experimental stations and farms in the different states with respect to organization, main achievements of past projects and aims of current investigations. An appendix showing expenditure on agricultural research and another listing the technical personnel of the central institutes and commodity committees are included. The book is illustrated by interesting photographs and by maps clearly indicating the whereabouts of the various institutions.

4941 Bärner, J.
Literaturquellen und ihre Kürzungen aus der Bibliographie der Pflanzenschutzliteratur. (**Bibliographical sources and their abbreviations in the Bibliography of Plant Protection**).
Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem 1958 : Pp. 167. (Mimeographed).

The list embodies the scientific periodicals used in the compilation of the Bibliography of Plant Protection [cf. 4942]. In addition to giving the full title of each periodical and the abbreviation used for it in the Bibliography, supplementary information is given in certain cases concerning the place of publication. The list is mimeographed and reproduced without particular regard to accentuation, and sometimes even to spelling, in many Spanish and Portuguese and some French titles.

4942 Bärner, J.
Bibliographie der Pflanzenschutzliteratur 1948–1949. (**Bibliography of plant protection, 1948–49**).
Paul Parey, Berlin 1958 : Pp. xli + 689.

The bibliography has been compiled on the same lines as its predecessors [VIII, p. 305] except for the introduction of a certain number of subheadings on account of the greater volume of material.

4943 Hutchinson, J.
Genetics and the improvement of tropical crops.
Cambridge University Press 1958 : 3s. 6d.: Pp. 30.

In his inaugural lecture Professor Sir Joseph Hutchinson first examines the variability that is characteristic of cultivated plants and finds it sufficient to provide breeders with material for improvement by selection in most crop plants, without the aid of artificial agents for increasing variation. The cotton plant has been shown to develop variability in all areas of its wide distribution, not only at a so-called primary centre of diversity in Vavilov's sense, and similar situations are encountered in other plants that are not strict self pollinators, such as sorghum, maize, tomato and, under certain conditions of environment, even wheat, peas and *Phaseolus* spp. The value of maintaining genetic heterogeneity, even in plants that are usually rigidly inbred, is exemplified by synthetic hybrids in maize, particularly in conditions where complete uniformity of product is not essential.

The introduction of resistance to *Puccinia polysora* into the maize races of East Africa and of resistance to grain weevil into early sorghums in Tanganyika, and the production of long-season cottons suitable for growing in Uganda and of jassid-resistant cottons of high quality in Tanganyika are given as examples of successes in plant breeding resulting from clear definition of the objectives and singleness of purpose.

4944 Săvulescu, T. (Editor).
Porumbul. Studiu monografic. (**Maize. A monographic study**).
Editura Academiei Republicii Populare Romîne 1957 : Lei 114 : Pp. 926 : figs. : tables : plates.

Over thirty Rumanian investigators contribute to this monumental work weighing over half a stone. Maize has become a crop of increasing importance in Rumania during the last half century and the present volume, which covers in considerable detail all the main aspects of maize cultivation and utilization, provides an invaluable introduction to anyone interested in Rumanian maize.

Plant breeders will find chapters VI, VII and XVII of principal interest. Chapter VI, Ameliorarea porumbului [Maize breeding] is by V. Moşneagă, V. Velican and A. Priadcencu, the first two authors being maize specialists and the third Director of the Plant-Breeding Section of the Rumanian Institute of Experimental Agronomy. Maize breeding has suffered considerable vicissitudes in Rumania during recent years. The earlier work was along classical lines; then came the period in which Lysenko's views were in vogue and the hybridization of inbred lines discountenanced, and now we find a return to the former state of affairs with, however, rather subdued reference to genetical determination. The above chapter, which runs to nearly a hundred pages, reflects all these changes, and is principally concerned with breeding methods. A description is given of Rumanian experiments on intervarietal crossing undertaken during the Lysenko period but more recent work on hybrids between inbred lines is also mentioned.

Chapter VII, Soiurile, populaţiile şi hibrizii de porumb raionaţi in R. P. R. [Varieties, populations and hybrids of maize approved for the various regions of the Rumanian People's Republic] is by V. Moşneaga. It provides detailed and lavishly illustrated accounts of the origin, characters and regional adaptation of the major Rumanian varieties and hybrids.

Chapter XVII, Bolile porumbului [Maize diseases], by A. Săvulescu, is a comprehensive survey of the maize diseases occurring in Rumania with extensive allusion to sources of resistance, particularly in local material. This chapter is of quite general interest since some of the diseases, for instance *Sorosporium holci-sorghi*, have not been extensively studied by plant breeders elsewhere.

The topics covered by the remaining chapters include the economics of maize production in Rumania and the world at large, the morphology, anatomy and taxonomy of maize, chemical composition, climatic adaptability, seed production, treatment of the soil, sowing, weed control, irrigation, harvesting, insect and other pests, storage methods, use of maize for animal nutrition and mechanization.

4945 BUHR, H. & NEYE, W.
Die Kartoffel. **(The potato).**
Neue Brehm-Bücherei, Wittenberg Lutherstadt 1958 : DM 6.50 : Pp. 135 : 35 figs. : 10 tables : 5 maps.

This small volume gives a popular account of existing knowledge on such questions as the origin of the potato [cf. XIX, p. 928], its introduction into cultivation, taxonomy, varieties, their nomenclature and their registration; the lists of approved varieties for the German Democratic Republic and for the Federal Republic in 1957 are reproduced. The morphology and anatomy of the potato plant and all its parts are described, with illustrations; features of climate and soil and correct cultivation measures are outlined, the factors affecting yield, composition and quality are examined and the main pests and diseases of the potato are described. A section on breeding states the main objectives of a potato breeder and the chief methods employed in achieving them. Finally the methods of testing and certification of new varieties and of seed-tuber multiplication are outlined.

4946 **Cotton atlas of India, 1957.**
Indian Central Cotton Committee, Bombay 1957 : Rs. 15 : Pp. iii + 100 : figs. : tables : maps.

This useful atlas contains maps, charts and tables which provide statistical information on all aspects of cotton production in India and which clearly show the progress achieved from the agricultural and economic points of view during recent years. The role of improved varieties is indicated. World trends in cotton production, consumption and trade are also depicted.

4947 LUCAS, G. B.
Diseases of tobacco.
The Scarecrow Press, Inc., New York 1958 : $10.00 : Pp. viii + 498 : 156 figs.

This highly informative account of tobacco diseases is the product of a commendable attempt to review all the relevant literature. The author is primarily concerned with tobacco diseases occurring in the USA but those of importance elsewhere are also considered. Unlike Hopkins, who in writing on the same subject [cf. XXVII, p. 165], dealt with the diseases found in Africa and was mainly concerned with the destruction of pathogens and the improvement of unfavourable environments, the writer of this new book is more interested in the breeding of disease-resistant varieties.

The volume is divided into eight sections. Part 1 includes chapters on the management of seed beds and crop rotations in relation to disease control and on the development of disease-resistant varieties; in this latter chapter, the principles involved in breeding for resistance are outlined and progress made in this work is briefly reviewed.

The following five sections deal with diseases caused by nematodes, fungi, bacteria, viruses and flowering plants; there is also a section on miscellaneous disorders including injuries caused by unfavourable weather, harmful chemicals and genetic abnormalities such as chimeras and gigantism.

In dealing with diseases caused by pathogens, the characteristics of the parasite and the symptoms produced on the host are described. Special attention is given to relations between host and parasite; for example, the mechanism of the wilting caused by *Fusarium* is discussed. Also considered is the influence that environmental factors may have on the occurrence of pathogens and on the reaction of the host, the interaction of different pathogens being mentioned. Suitable control measures, where these are known, are outlined for each of the diseases described.

Full bibliographies are provided at the end of each chapter and there is a good index. Most of the diseases mentioned and the effects of certain control measures are illustrated by photographs of varying standard; there are also drawings of some of the pathogens. Unfortunately the book is not so well produced as most works of this kind, having been reproduced by photooffset from typed pages.

Nevertheless the author has succeeded in his aim of providing a volume which will be of use to the tobacco grower and to those involved in teaching or research.

NEW JOURNALS

European Potato Journal.

The above journal is published by the European Association for Potato Research which was formed in August 1957, "to promote the exchange between the various countries of scientific and general information relating to all phases of the potato industry and to encourage and assist international cooperation in the study of problems of common interest in this field". The first issue includes articles of interest to breeders and geneticists working on this crop [cf. 4372 *seq.*]. Further information concerning the Association and journal may be obtained from the Secretary, Dr. D. D. van der Zaag, P.O. Box 20, Wageningen, Netherlands.

Experimental Horticulture.

This publication is complementary to *Experimental Husbandry* [XXVI, p. 713] and will provide a similar service for growers of fruit, vegetables and flowers, its chief purpose being to give accounts of the experimental work undertaken by the National Agricultural Advisory Service (NAAS) for England and Wales. The work of trial centres other than those of the NAAS will also receive attention. The articles in the first issue include: The national fruit trials, J. M. S. Potter; Strawberry variety trials at Efford Experimental Horticulture Station [Hampshire], H. M. Hughes and J. M. S. Potter; and Raspberry variety trial in the Peak District [Derbyshire], R. C. M. Wright. Published by the Ministry of Agriculture, Fisheries and Food, Whitehall Place, London, S.W.1, the journal costs 3s. 6d. per copy.

Index to plant chromosome numbers for 1956.

The first issue of the above index, which is published by the California Botanical Society, has been compiled from journals appearing in 1956. It attempts to list the chromosome counts for the entire plant kingdom, with the exception of numbers resulting from experimental treatment or from endopolyploidy. A complete bibliography for the references is included. If sufficient interest is shown in the index, subsequent issues will appear annually and from time to time supplements will also be published. Price of the index is $1.00. Further information may be obtained from Marion S. Cave, Department of Botany, University of California, Berkeley 4, Calif.

New Zealand Journal of Science.

This general scientific quarterly is being published by the New Zealand Department of Scientific and Industrial Research. The first number includes an article on missing values in factorial experiments by G. M. Wright, summarized in this number of *Plant Breeding Abstracts.* The annual subscription is 20s., payable to the Publications officer, Department of Scientific and Industrial Research, PO Box 8018, Wellington, New Zealand.

Proceedings of the Genetics Society of Canada.

The Genetics Society of Canada was provisionally organized at the University of Alberta in February 1955, the inaugural meeting being held at Winnipeg, 15–16 February 1956. The proceedings of the Society are published annually. Further information may be obtained from A. Wilkes, Secretary-Treasurer, Genetics Society of Canada, Science Service Building, Carling Ave., Ottawa, Ontario.

Suid-Afrikaanse Tydskrif vir Landbouwetenskap/South African Journal of Agricultural Science.

This journal contains articles describing the results of research in connexion with both crop and livestock production in South Africa. The first issue includes a contribution by J. E. van der Plank on a new potato variety [4390]. Further information may be obtained from the Chief, Division of Publicity, Department of Agriculture, Private Bag 144, Pretoria.